DOCUMENT RESUME

ED 237 360 SE 043 574

TITLE Workshop for Key Personnel Concerned With Out-of-School Scientific Activities by Young People. Report of a Regional Workshop (Bangkok, Thailand, August 24 - September 2, 1982).

INSTITUTION United Nations Educational, Scientific, and Cultural Organization, Bangkok (Thailand). Regional Office for Education in Asia and the Pacific.

PUB DATE 82

NOTE 69p.

PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Descriptive (141)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.

DESCRIPTORS *Educational Trends; Elementary School Science; Elementary Secondary Education; Environmental Education; Foreign Countries; Museums; Nonformal Education; *Nonschool Educational Programs; *Program Descriptions; Program Development; *Science Activities; *Science Education; Science Instruction; *Science Programs; Secondary School Science

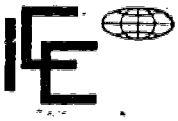
ABSTRACT

This workshop was designed to discuss the role of out-of-school science activities both in formal and non-formal education programs. Fifteen participants from Australia, Bangladesh, China, India, Indonesia, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, and Thailand attended the workshop. Highlights of reports presented by these participants and their subsequent review and discussion of the major trends, problems, and issues of concern in national efforts to promote out-of-school science activities are provided. Also provided are a set of guidelines for planning, organizing, and evaluating the activities. These guidelines are based on the experiences shared in the workshop as well as the various emerging trends, problems, and issues which are being faced by the organizers of such activities in the participating countries. A suggested outline for a training handbook for key personnel organizing the activities is included. The outline suggests an introductory chapter (including rationale for developing/implementing the activities), chapters focusing on planning, implementation, and evaluation methods/issues, and a final chapter on the special characteristics of selected out-of-school science activities. Appended are several short speeches, the workshop agenda and a list of participants. (JN)

SCIENCE SOCIETY OF THAILAND

WORKSHOP FOR KEY PERSONNEL CONCERNED WITH OUT-OF-SCHOOL SCIENTIFIC ACTIVITIES BY YOUNG PEOPLE

Report of a regional workshop
24 August—2 September 1982
Bangkok, Thailand



UNESCO REGIONAL OFFICE
FOR EDUCATION
IN ASIA AND THE PACIFIC
Bangkok

INTERNATIONAL COORDINATING COMMITTEE
FOR THE PRESENTATION OF SCIENCE
AND THE DEVELOPMENT OF
OUT-OF-SCHOOL SCIENTIEIC ACTIVITIES

Regional Workshop on

Out-of-School Scientific Activities by Young People

Bangkok, Thailand

24 August — 2 September 1982

REPORT

Organized by
Science Society of Thailand
on Co-operation with
Unesco Regional Office for Education in Asia and the Pacific
Bangkok, 1982

Chuan Printing Press Ltd. Part.
469 Phra Sumeru Road, Borvornives Distric, Bangkok 2
Tel. 2810541, 2822114, Mr. Chuan Somsongkram-Publisher, 1983

CONTENTS

INTRODUCTION

Background

The Workshop was organized by the Science Society of Thailand and in collaboration with Regional Office and the Asian Centre for Educational Innovation for Development. It was held from 24 August to 2 September 1982. The inaugural session was held at the Unesco office in Darakarn Building and the subsequent working sessions were held at the Bangkok Science Museum.

Objectives

The main objectives of the Workshop were to :

(i) discuss the role of out-of-school scientific activities both in formal and non-formal education programmes;

(ii) enable participants to exchange experiences in the planning, organization and evaluation of out-of-school science activities by young people and develop necessary guidelines on these aspects;

(iii) identify trends, problems and issues related to out-of-school scientific activities;

(iv) outline the contents of a training handbook on the organization of out-of-school science activities.

Participation

Fifteen participants from Australia, Bangladesh, China, India, Indonesia, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, and Thailand attended the Workshop.

In addition the Vice-chairman of the ICC for South-East Asia, three staff members from Unesco and some observers and resource persons from local organizations also attended thd Workshop. The list of the participants and observers is in Annex I.

Inauguration

The Workshop was inaugurated in the morning of Tuesday 24 August 1982 by His Excellency Dr. Kasem Sirisampan, Minister of Education, Government of Thailand. The participants were welcomed by Dr. Kamchad Mongkolkul, President of the Science Society of Thailand which was followed by a statement by Mr. Raja Roy Singh, Assistant Director-General, Unesco Regional Office for Education in Asia and the Pacific, and a report by Dr. Twee Hormchong, Chairman of the Workshop Organizing Committee. The text of addresses is in Annex II.

Officers of the Workshop

In the first plenary session the participants elected Dr. Mubarak Ali Akhand (Bangladesh) as Chairman, Mr. Boonreong Kao-sa-ard (Thailand) as Vice-Chairman, and Dr. Michael Gore (Australia) as Rapporteur of the Workshop. Dr. Pisarn Soydhurum acted as Secretary of the Workshop.

Venue

The Workshop was held in the Geodome of the Bangkok Science Museum. This provided a very good environment for the participants of the Workshop because during the period of the Workshop the museum was having an Asian Science Fair, as well as a number of programmes for school children both from the city and outside rural areas. This setting enabled the participants to have a first hand experience of planning and organization of out-of-school scientific activities.

Method of Work

Prior to the Workshop each participant had been requested to prepare a discussion paper containing a general description of the various on-going out-of-school scientific activities for young people, both in the formal and non-formal education programmes; short write-up of one of the major out-of-school science activities either organized by the participant or in the organization of which he played a key role, particularly covering aspect such as planning, objectives, organization. evaluation and outcomes of the activities; and problems and issues being faced in planning, designing and organization of such activities and the attempts that are being made to solve these problems as well as the new trend in regard to such activities in his country.

In the first plenary the Workshop had the benefit of listening to a key note address by Dr. Sanga Sabhasri, Under Secretary of the Ministry of Science, Technology and Energy in Thailand. In the subsequent plenary sessions, two more papers, one on "The Global View of Out-of-School Scientific Activities" by Dr. G. Teterin, and the other on "Out-of School Scientific Activities in Asia and the Pacific Region – The Rationale and an Overview" by Dr. M.C. Pant were presented.

In five plenary sessions the participants presented their papers to share their experiences; the highlights from these papers are given in Chapter II in this report. The presentations were followed by general discussions during the next two plenary sessions to identify the main trends and delineate major problems and issues with regards to the planning, organization and implementation, and evaluation of such activities. The Workshop then divided itself into three groups, and prepared the guidelines on the above three aspects which were then deliberated by the Workshop in a plenary session for finalization. In the subsequent three plenary sessions, the Workshop prepared the outlines for a handbook for training of key personnel in out-of-school scientific activities.

The participants of the Workshop had also the benefit of field trips to the crocodile farm, orchid farm, mushroom cultivation nursery, zoological garden, and viewing a planetarium show, as well as a visit to historical and cultural places in Bangkok and nearby.

In the last plenary session, the Workshop considered its draft report and following some modifications it was adopted.

Chapter Two

HIGHLIGHTS FROM PARTICIPANTS' PRESENTATIONS - TRENDS, PROBLEMS AND ISSUES

This chapter contains summaries of the reports provided by the participants attending the Workshop and their subsequent review and discussion to identify major trends, problems, and issues which are of concern in the national efforts to promote out-of- school scientific activities.

AUSTRALIA

Out-of-School Science Activities in Australia Using the 'QUESTACON' as an Example of a Recent Innovative Development

In the past ten years, the scope and magnitude of out-of-school science activities in Australia has increased quite dramatically in common with many other countries in the world.

Co-ordinated educational activities associated with zoological gardens, museums, botanical gardens and field centres have steadily increased. There has been a pronounced expansion in the number and variety of programmes offered, and in particular a marked escalation of hands-on activities.

One very exciting project which has emerged in Australia in recent years was launched by a special educational innovations programme set up by the Australian Commonwealth Schools Commission.

The 'Questacon' is Australia's first wholly participatory science centre concerned mainly at present with the physical sciences and it is believed that it is the first of its kind in the Southern Hemisphere. The centre was opened on an experimental basis in September 1980.

At present, the 'Questacon' is not open to the general public and is almost exclusively used by organized groups of school children who are visiting the centre in numbers up to 600 a week from all over Australia.

The great strength of the 'Questacon' is the way that its hands-on exhibits have proved themselves capable of stimulating in the students an interest and awareness in scientific and technological principles. They find that interacting with the exhibits is both exciting and entertaining, and the 'Questacon' staff make a particular point of trying to take the mysticism out of science by showing visitors the everyday applications of scientific concepts.

The 'Questacon' was a drawing board dream in 1978; began operating in September 1980 with only 15 exhibits, and by February 1981, this number had increased to 30. Today the 'Questacon' has over 60 exhibits.

The 'Questacon' is housed in an old school building in the middle of Canberra. One of the most exciting aspects of the centre, apart from the exhibits, is the staff. The Explainers as they are called, are secondary and tertiary students, who attend a special series of training lectures given by staff members from the various tertiary institutions in Canberra.

The 'Questacon' can truly be said to be a science centre which is, "of the students, by the students and for the students". The student Explainers mix informally with visitors to the centre, answering questions, explaining how to use exhibits, and generally promoting a friendly and relaxed atmosphere. In this way, the Explainers not only further their own scientific understanding, but they also promote their own skills in human communication.

During 1982, the 'Questacon' came under consideration by the Australian Bicentenary Authority as a possible scientific project to mark the 1988 celebrations. If this comes to fruition, it will mark a major turning point in the development of the centre.

The 'Questacon' has been described as the most imaginative and innovative project currently existing in Australia aimed at stimulating an interest and awareness in science and technology. The 'Questacon' has set out to demonstrate that science and technology are fascinating, relevant and a necessary integral part of our modern society.

The centre has come a long way in the three years since its inception and this has been partly achieved by the combined efforts of Australian scientific organizations and many branches of Australian commerce and industry.

With a similar rate of development in the next three years, the 'Questacon' will undoubtedly come to have a far-reaching effect on the way in which many Australian students will approach science and technology, because interactive science centres all over the world have demonstrated they have the capacity to stimulate in people the desire to find out for themselves, and this is embodied in the name 'Questacon', which means "to seek" and "to study".

BANGLADESH

Introduction

The Government of Bangladesh has given high priority to science education in order to create skilled workers for the development of the country. It has, therefore, become imperative that along with the formal educational system, appropriate programmes for the non-formal science education should immediately be undertaken in order to educate the vast number of illiterate people – so that the country may attain self-sufficiency and look forward to a better future in all respects.

Out-of-School Science Education Programmes

A wide variety of non-formal educational activities sponsored by various Ministries,

public, private and co-operative agencies, organizations and even individuals now exist. The contents are flexible and varied according to the immediate requirements. All these programmes include out-of-school children, youth and adults, irrespective of age.

Some of the organizations and media concerned with out-of-school science activities are : Museum of Science and Technology; Science Clubs; Mass-media; Community Schools; School Broadcasting Programme; and National Science Week.

Museums

In a developing country like Bangladesh, the Science Museum plays a vital role in educating the out-of-school children, youth and adults.

Some of the main objectives of the Museum are : to display exhibits; to promote an interest for science and technology; to supplement formal teaching; to encourage the young scientists; and to co-ordinate, encourage and help the science clubs.

These objectives are achieved in the following ways :

Demonstration lectures : As in most of the high schools science education suffers a lot due to lack of facilities for experimentation, the Museum arranges easy to perform experiments and various demonstration aids prepared from locally available low-cost materials. The demonstration lectures are delivered on suitable topics included in the secondary or higher secondary science syllabi. Demonstrators and experts are also sent to schools for supplementary lectures.

Radio, television and VTR programmes: Various science education programmes showing the exhibits are organized regularly through radio and television. VTR programmes are also shown to groups of visitors.

Popular lectures and film shows : Lectures or film shows on popular science topics are arranged in the Museum regularly.

Co-ordination of science club activities : A major role of the science museum has been to encourage science club activities. It provides expert guidance and workshop facilities and is currently co-ordinating and helping about 500 science clubs all over the country. The museum has published books relating to science club activities and made suggestions about the best kind of exhibits developed by the science clubs.

Sky-observation programme : There is a regular programme for observing celestial bodies, lunar eclipse, solar spots and eclipse through a reflecting telescope.

Library-publication and workshop : The Museum of Science and Technology has established a library which is available for amateur scientists. It publishes regular scientific booklets and journals. A small workshop consisting of electrical, mechanical, electronics and photographic sections helps amateur scientists with their projects. The Museum also organizes various national and international workshops and seminars.

Science exhibition : Selected exhibits, models and projects made by amateur scientists are displayed by the Museum.

The Science Club Movement

About 500 science clubs are currently functioning in the country. Some are associated with educational institutions, and some, independent. Local science teachers or scientists act as advisers, and these clubs mostly act as supplement to formal school education.

In Bangladesh, tools and equipment are expensive and therefore much use is made of local indigenous low-cost materials and resources. A number of science clubs have built their own laboratories, workshops and libraries, and many are organizing projects of economic importance.

The Role of Mass Media

Newspapers, radio and TV are very effective in the dissemination of scientific knowledge. Regular radio and television scientific programmes are becoming more and more popular.

The Community Schools

The Government has recently started a scheme for the establishment of community schools at thana level in the country. The objectives of this school is to establish linkages between the community and school and to function as a centre for the development of skilled manpower. Trade courses on agriculture, housing, elementary mechanics, food preparation-preservation, knitting and embroidery are proposed to be offered. The courses will be in modular form and each trade course will be of 4 to 6 months' duration. The science and technology component will be a built-in part of these courses.

National Science Week

Science exhibitions can promote scientific interest and curiosity, thus enabling the people to look at their problems with scientific rationalism, make their own observations, tackle their own problems and encouraging independent decision-making. With this philosophy in mind, a science movement known as "National Science Week" is being observed every year throughout the country, under the sponsorship of the Science and Technology Division of the Government.

The objectives of the National Science Week are : to develop "scientific literacy"; to encourage students' creative activities; to encourage the use of indigenous materials; to encourage science clubs and associations; and to search for young scientific talent.

The activities of the Science Week are organized at the subdivisional and central level.

Exhibitions concerned with different aspects of science are organized by the young scientists of different educational institutions and science clubs and innovators.

From the little experience, it can be inferred that the National Science Week is playing a vital role in popularizing and making the fruits of science and technology available to all.

Problems and Issues

Since the start of the National Science Week in 1978, it has been found that only the institutions adjacent to the venue are participating in the exhibition. A number of institutions

are not taking part because of accommodation problems, poor financial support, lack of motivation and supervision, and inadequate workshop facilities.

Problems and Issues in Summary

- Proper attention is not being given to the organizations concerned with out-of-school science activities.
- Lack of co-ordination amongst all these organizations is a great handicap in the attainment of the expected results.
- Periodic survey, assessment, evaluation, expert-guidance, motivation and supervision are not being made on time.
- Shortage of trained, experienced and skilled teachers and experts, inadequate resources, materials, equipment, necessary facilities including workshop facilities, maintenance work, are other problems.

CHINA (People's Republic of)

Close collaboration has been established between the central and local governments, and between communities and the schools in order to develop scientific activities for young people.

A National Leading Group for Young Peoples' Scientific Activities was fo ed in June 1981 to work out the programme of scientific activities for young people; identify and solve problems involved and make proposals to the government; organize national activities and meetings to make possible the exchange of experiences; commend leading agencies and individuals in this field, and stimulate international exchange. Similar groups have been set up at the provincial, municipal and regional levels. Apart from these groups, each of the Chinese Academic Societies has set up a committee for popularizing science to help young people in their out-of-school scientific activities. Young amateur scientist associations in different disciplines enable members to obtain instruction and guidance from professional scientists and technicians. On the basis of these local associations, the Chinese Association of Instructors for Young Peoples' Scientific Activities was founded in 1981.

Scientific activities in China are organized in various forms. Apart from the more usual forms such as science exhibitions, summer science camps, science contests, the following are some of the innovative activities:

1. A movement called "Love for Science Month". During the month, pupils in primary and middle schools are asked to undertake several "one-thing" study, e.g. a study about one scientist, one book dealing with science, one phenomenon, one science artifact. These activities have greatly helped pupils to get acquainted with knowledge in many different aspects of modern science and technology.
2. Team programmes oriented towards young amateur scientists. Places outside schools specifically built for amateurs, such as children's palaces, children's homes, stations for children's out-of-school activities and spare-time sports schools, serve

as centres in which training classes are run for science instructors and from which amateurs may get guidance.

3. China has begun to set up centres functioning as bases for out-of-school activities and as centres for guidance and research.

The principle which guides science activities for young people is to foster among young people the necessary temperament and attitudes to enjoy and make use of science and technology. This is achieved through arousing their interest in science; training them to make use of basic scientific knowledge and technical skills; observing, thinking and practising; and fostering scientific approaches for seeking truth from facts, a rigorous, meticulous and creative approach.

Because of the vast area of China, the activities in some remote areas have developed comparatively slowly. There exists lack of equipment, facilities, locations, funds and instructors. Theoretical research on scientific activities for young people has only started recently. Some of the problems to be solved are : the relationship between curricular teaching and extra-curricular activities; the role of scientific activities in bringing up a new generation of scientific and technological personnel; how to conduct the activities in the countryside; how to combine popularization with the raising of standards. Much more experience is needed to improve and promote scientific activities in China.

PAKISTAN

Bearing in mind the significant role of science and technology in the advancement of a nation on the one hand, and being aware of the limited facilities and resources for formal science instruction in the country on the other, the Government of Pakistan, in addition to providing facilities for formal instruction, has introduced from time to time, various non-formal means for the promotion of science education.

As schools, colleges and universities are entrusted with the formal teaching of science to only a fraction of the population, the awareness of science among the masses depends much on the scope and effectiveness of the non-formal sources.

In the 1979 national educational policy statement on science education, it has been stated :

> ".....In view of the vital role that science education plays in national development, it has been decided that a National Centre for Science Education will be established to improve science teaching through research and innovations and to promote and popularize science and technology among the masses through science fairs, museums, film, etc."

It is expected that the Centre will provide a co-ordinating link for the organizations and institutions presently engaged in formal and non-formal science education activities.

The Pakistan Association for the Advancement of Science (PAAS), the Scientific Society of Pakistan (SSP), the Pakistan Association of Scientists and Scientific Professions (PASSP), the Institute of Electrical Engineers (IEE), the Pakistan Medical Association

(PMA) and some other similar professional associations all provide forums for lectures, conferences, annual meetings and occasional seminars. A monthly journal called "Science" has been published by the PAAS regularly since 1972.

A Science Club exists in Karachi under the patronage of the Science Society of Pakistan (SSP). This society had its latest science exhibition in the summer of 1981.

During 1981, a science fair was also arranged at the National Museum of Science and Technology. Also, during October of the same year, the Electronics Society of the Engineering University Students put on an impressive display of student-built electronic and electrical projects.

The Pakistan Science Foundation (PSF) which oversees and provides financial support to the various societies and associations in the country is involved directly with the establishment of the first Natural History Museum.

Traditions have existed in selected high schools, mostly located in urban areas, public schools, cadet colleges and colleges and universities of running science and hobbies clubs. Initiated by a few talented and interested individuals, these clubs have remained active as long as those students were in the institution. With some assistance from their teachers and one or more of the science organizations of the country, they have successfully presented exhibitions, conducted seminars and arranged lectures.

The Pakistan TV and Radio has always included in their presentations science programmes, e.g. "Science Magazine", "Science Club", programmes for farmers and on health and hygiene, science quiz shows. Documentary films are also shown often which are popular among the younger people.'

The newspapers also publish articles on scientific topics of general interest, written mostly by professionals, but for the general readers to comprehend.

Whereas the Government is keen to promote activities directed towards providing and ensuring formal and informal educational opportunities for all, the population growth rate, currently estimated an alarming 3 percent, combined with the resource constraints of a developing nation, have continued to pose a massive challenge for the planners.

Inspired by the success of a previous large-scale science exhibition held at Lahore in 1974, the Pakistan Science Foundation offered financial and material support for organizing a large-scale science fair involving school as well as college students and also other science and technology professional organizations. The objectives of the fair were:

- To introduce science to students, teachers and the general public in a manner that fascinates them;
- To make people conscious of the importance of science and technology, and to highlight the overall challenge that science poses to talented minds;
- To provide visitors an opportunity of observing the work of scientists and others in scientific professions;
- To induce and encourage the young students in the development of innovative scientific models.

The fair was held at the National Museum of Science and Technology in February 1981, for a period of two weeks, with 25 selected boys and girls schools, eight colleges and eleven professional organizations participating. Altogether, there were 259 models, experimental units and individual science projects presented.

The daily programmes included science film shows, popular science lectures and discussions, and display demonstrations. Over 100,000 visitors of all kinds, e.g., students, teachers, parents, etc. attended the science fair.

In retrospect, there are a few points that need to be kept in view when planning for a future activity of this kind:

- The large number of daily visitors (7–8 thousand over a six-hour period) was far more than the organizers had hoped for. Frequent crowding of stalls kept genuinely interested visitors from benefiting fully;
- The presentations generally reflected not only the effort of students but also the level of interest and ability of the respective science teachers in this type of activity;
- There was no common theme that would have inspired innovation, originality and competition;
- The fair was primarily organized for the students. Hundreds of thousands of youngsters who strive to make a living through scientific and technological skills (e.g. automechanics, electricians, radio/TV repairmen, etc.) could not benefit from the activity;
- The fair failed to stimulate other organizations in the country to promote similar activities;
- Although the fair provided young men and women with an excellent opportunity for an out-of-school science activity, yet, it appeared generally, that very large segment of visitors preferred socializing rather than showing interest in the effort;
- The science films and lectures attracted few people.

INDIA

Out-of-school science activities are supplementary to classroom teaching, and are tailored to the abilities and interests of pupils.

A large number of such activities are organized in India, such as Science Clubs; science fairs and exhibitions; science museums; fields trips; environmental education; non-formal education; working with community; and mass media and distant learning, a few of which are listed and described below.

Science Fairs and Exhibitions :

Science fairs and exhibitions are organized at four levels, i.e., school, district, state and national level. These exhibitions are sponsored by the National Council of Educational Research and Training (NCERT). The National science exhibitions are held at New Delhi.

Science Museums :

The main objectives of science museums are to help young people to understand the concepts of science. They also help schools by promoting activities with equipment and specimens which are otherwise difficult for a single school to procure.

Science museums are available to only a few schools. During the last decade, a couple of museums of science have been created. A National Council of Science Museums has also been established with its headquarters at Calcutta. A brief description of a few important science museums is given below:

(a) **Vikram Sarabhai Community Science Centre, Ahmedabad**

The Centre is one of the pioneer organizations in the country providing a variety of out-of-school activities in science for students, teachers and community. It has a team of highly qualified staff which acts as the catalyst for various programmes such as the development of new educational materials dealing with the problems of primary science and mathematics; environmental studies; integrated science; science learning improvement programmes through enquiry; mathematics laboratory; teacher orientation; and designing and development of teaching and learning aids.

The Centre has set up a science play-ground : where children get a glimpse of science through play toys, musical pipes, sand pits, water pond and evolution pillar.

(b) **Nehru Science Centre (NSC), Bombay**

The Nehru Science Centre has been established by the National Council of Science Museums, India. One of the most important and attractive part of NSC is a "Science Park" for children. Set in green surroundings, children in the science park have exhibits involving time, motion, energy, power and work. There are railway engines, tram-cars, aeroplanes, steam lorries, a wind mill and a sundial. There are birds, animals and fishes to acquaint children with nature.

The Nehru Science Centre also organizes extension activities such as science extension in rural areas, film shows, science quiz contests (both oral and written), science seminars for schools and junior colleges, film loan service, amateur weather station, sky observation programme, astronomical camp, popular science lectures, special science film festivals, aeronautic modelling programme, training camps for under privileged children and amateur radio classes.

(c) **National Museum of Natural History, New Delhi**

The National Museum of Natural History is a unique facility designed to serve the general public. It provides opportunities for people to acquire direct experience in understanding the fascinating world of nature, the delicate inter-relationship among plants, animals, and the environment and the need to develop the new approach and ethics towards our natural environment.

The museum organizes informal activities where students can handle and examine the specimens to interact with live animals, to participate in creative activities such as modelling and painting.

(d) **Visvesvaraya Industrial and Technological Museum, Bangalore**

Visvesvaraya Industrial and Technological Museum, Bangalore organizes the following activities : motive power gallery (science museum); teacher's training; hobby centre; students' science seminar; science quiz; science fair; exhibitions; science demonstration lectures (on request); mobile science exhibitions; and film shows.

Field Trips :

Science field trips are organized in India by a number of agencies such as colleges, universities and schools, national museums, and science clubs.

Environmental Education :

The National Council of Educational Research and Training has developed an environmental education programme for the school age going children from Class 1 to 5. It is using the environment in teaching and understanding of science concepts as the main platform.

Non-formal Education :

Non-formal education is imparted in selected centres instead of schools. The centres are managed by a single teacher, and there is considerable scope for teaching of science in the centre.

Mass Media and Distant Learning :

During the last decade India has entered the space age and the concept of distance learning has arrived. Science is effectively brought nearer to young people and society through radio broadcasts, satellite television programmes, the publication of science journals, articles, newspapers, open school created by Central Board of Secondary Education, India; correspondence courses offered by Regional Colleges of Education.

National Science Exhibition :

Science exhibitions play a very important role in education. Scientific understanding is obtained only when students themselves develop a keen power of observation and analysis by conducting scientific experiments. The more the students learn about science and environment the better grasp they obtain about the laws of nature.

In India science exhibitions and organized at : school, district, state, and national levels. The states select exhibits from school and district level science exhibitions. From these items entries are made for the state exhibitions. Selected entries from the state exhibitions are sent for the National Science Exhibition organized by the NCERT.

Objectives :

The objectives of the exhibition are :

(i) to develop a scientific and creative attitude;
(ii) to create scientific environment among the students;
(iii) to motivate the students to experiment for themselves;
(iv) to develop original thinking.

INDONESIA

On-going Out-of-School Scientific Activities

Out-of-school scientific activities for young people have entered the Indonesia scene only recently. Currently the Indonesian Institute of Sciences in collaboration with science teachers in Jakarta and the National Television Network is organizing a science contest to boost interest in science among high school students. The contestants are grouped into seven clusters depending on the subject area, namely, social science, applied technology, electronics, physics, chemistry, biology and mathematics. The topics for research are given and communicated via the television programme to the contestants throughout the country. Participants submit their research projects to a committee in Jakarta. The best students are then invited to Jakarta to expose their respective projects to an examining committee. This year more than fourteen hundred students are participating and of these 55 have been invited to Jakarta.

The other activity organized by the Ministry of Education and Culture stems from an entirely different philosophy. The contest is open to all young people between the ages of 12 to 21, irrespective of their educational background and status. The topics are completely of their own choice and participants can choose whatever problem they think is worth investigating and is likely to produce worthwhile results within a reasonable time span. The paper is submitted directly to an organizing committee in Jakarta. An examining committee of 12 members is appointed by the Minister of Education and Culture each year, consisting of prominent scientists from universities and research institutions. Between 5 and 20 are chosen, and the respective young scientists are invited to Jakarta to be interviewed by the examining committee and winners are then selected. The results are published in the press.

One of the key elements that is very important is giving the participants freedom to choose their own research problems. Experience indicates that the young scientists quite often see problems which have escaped the notice of their senior fellows. An example is this year's second prize winner – a 15 year old girl from a small village in central Java. A small insect (Hage-nomyia micans) apparently had fascinated her because of the fact that it moves backwards. The local people have named it "undur-undur", meaning moving backwards. She wanted to learn why it behaved the way it did and after studying the structure of its body she found at least six reasons why this particular creature preferred to move backwards. She studied how this creature trapped its prey by creating an inverted cone in the sand. She investigated the speed of its movements both forward and backward using a pair of transparent rulers clipped together by elastic so as to align the direction of movement and at the same time providing her with a readable scale so that she could read the coordinate whilst synchronising it with her stop-watch. She made a comparison of its speed in sand, and on dry, wet and slippery surfaces. She observed that in creating its nest-cone the creature always moved backwards in a "counter-clockwise" fashion, although, she still could not explain why it never did it the other way around.

This spontaneous effort would never have occured if one had restricted the topic of the contest to what the teacher or organizers thought to be a good research problem.

Another element that is also important is the selection of the members of the examining committee which should consist of prominent scientists working in universities and research institutions. It may look odd at first that for a contest aimed mostly at secondary school students one needs to have the best scientists as judges. The first year experience showed how little the community understood as to what the word science meant. As the papers were submitted directly to the organizers at Jakarta, they had a fair knowledge of what science meant to these young people from various parts of the country. Although in the first year, due to a very intensive campaign, a large number of papers (more than 800) were received, the majority contained "unconceivable logic", which was far from what the organizers had expected (or assumed). Reading those papers, members of the examining committee, namely the scientists, became exposed to the "real life" that exists outside the university campuses and research institutions, where people speak a different science language.

A campaign had to be mounted and in the successive years members of the examining committee gave talks in provinces to pave the way for the successive years of the contest. The path has not always been smooth and in terms of numbers of participants the number never exceed that of the first year. In terms of quality, the efforts have slowly begun to bear fruits. The organizers are confident that, scattered throughout the country, there are young people who are willing to devote their time, energy and sometimes money in scientific researches. These young people will keep their eyes open and observe and study their environment closely.

The third element that is important is the communication network. The support given by the mass media in introducing the winners to the public has created an entirely different image compared to the past. If several years ago the society only recognized youth festivals in sports and arts, now they are beginning to realize that research and science is not only the business of a small group of highly trained people but can be cultivated at an early age and even without attachment to a formal education system.

Under a bilateral agreement, Philips Company has been participating as a sponsor to provide the prizes for the winners. The first prize consists of a visit to Europe to participate in the annual European Young Scientist Contest as an invited guest. So far there have been two occasions where the winners were allowed to participate in that Contest. This has helped to gauge whether our young scientists have reached the necessary standard required of them to participate in international contests.

Looking back at the history of how science is known to the Indonesian community, there has been an 'imbalance' in its development. In the past science has been imparted mostly through schooling so that what had been communicated was mainly the "products" of science. Students were taught about scientific findings in the hope that they could use this knowledge to improve their quality of life. Even when teaching practices in schools were improved to encourage more of student participation, it was found to be still highly designed to cope only with the prescribed school subjects. Actual science activities were relatively few.

This contest it is hoped, can serve to remedy the 'imbalance' by providing an opportunity to do science by working directly through research. One problem that is being faced is the lack of means to communicate what is considered to be good scientific work to these young people. So far it has not been possible to find a book on methodology of scientific research which would be appropriate for the young scientists. Most books on the subject are likely to be "dry" and "too abstract" for these young scientists. Perhaps by exposing them to good research work repeated they would eventually grasp the rules of the game in scientific research. A step that has been taken is to publish the research project of the winners and to distribute them to the school libraries.

NEPAL

Out-of-School Scientific Activities

The Natural History Museum of Nepal, has launched several out-of-school scientific activities for young people, both in the formal and non-formal education programmes. One such activity is the organization of mobile science exhibitions in outlying districts every year. So far it has travelled to 16 separate districts. Another activity conducted by the museum is the use of local materials for science teaching in schools and to train teachers to prepare displays from local materials at low cost in order to create public interest in science. The museum has also trained many young graduate students to participate in village activities in remote areas of the kingdom.

The Natural History Museum has been organizing annual scientific exhibitions on World Environment Day (5 June). In 1980, the museum displayed Himalayan pheasants, barking deer, red panda and other interesting specimens showing the need for the conservation and management of wild life, forests and the significance of biological control in the maintenance of ecological balance and preservation of the environment.

To mark the occasion of the National Education Day, an exhibition was organized and more than nine thousand people visited the exhibition, where nearly eleven hundred specimens of birds, representing five hundred and fifty nine species of Nepal birds, rare specimens of butterflies, moths, and more than a hundred herbarium sheets were on display.

The Royal Nepal Academy organized a science exhibition to mark its Silver Jubilee ceremony. This exhibition was the first of its kind in Nepal in which several government and semi-government organizations, including the Natural History Museum, displayed different aspects of their scientific activities.

On the occasion of its 23rd anniversary, a science exhibition programme was also organized by the university.

From time to time the staff of the museum delivers lectures to science teachers of lower and higher secondary schools in different districts of the kingdom. The Natural History Museum has also promoted the establishment of the Nepal Science Club which is a group of

enthusiastic young students from different campuses of the kingdom and has launched a series of out-of-school scientific activities.

Activities Organized for the General Public

The mobile exhibition programme has been considered one of the major out-of-school science activities in Nepal. An important objective of the mobile exhibition is to introduce the natural heritage of Nepal to the students as well as to the public, thereby combining theoretical knowledge with practical examples of the syllabus-related specimens.

Problems and Issues

To launch mobile exhibition programmes in remote areas, is difficult. In spite of problems the museum has run such programmes every year since 1977. Some of the problems experienced by the museum staff in such activities are :

a) Lack of well equipped museobus.
b) Limited and untrained manpower.
c) Lack of audio-visual aids.
d) Safe and proper transportation of exhibits.
e) Lack of proper communication facilities.
f) Lack of suitable sites for exhibition.
g) Limited funds.

NEW ZEALAND

There are a range of out-of-school scientific activities currently existing in New Zealand.

Field Trips

Most senior primary and secondary classes conduct at least one field trip each year. These must have specific aims related to some aspect of the curriculum that cannot be covered at school, such as forest studies, climate, soils, geography or geology. The teacher plans a programme, including aspects of safety, and the children practise safety skills. Approval from the local educational authority is needed. An adult/child ratio of 1 to 6 is required. They are usually housed at field lodges, some of which are owned by groups of schools. Some lodges have a teacher permanently stationed at the lodge. One-day field trips are also arranged which require only the headmaster's approval.

Education by Correspondence

Students living in remote areas of the country are served by a very effective Correspondence School based in Wellington. The children, both primary and secondary, work from set "assignments", sent regularly by mail, under the guidance of their parents, and supplemented by radio lessons each morning. Their work is then sent in for comment and assessment. Hence their science lessons are covered in their homes, by using the assignments, text-books, kit-sets of apparatus, and their local environment.

Museum and Allied Services

There are over one hundred museums, two zoos, one marine mammal zoo, aviaries, and aquariums. Whereas at one time, children were not admitted to museums unless accompanied by an adult, they are now warmly welcomed. The main museum and zoos have specially trained teachers attached to them to take school parties and the Wellington zoo includes a special classroom complex. One modern pleasing trend is that children are allowed to handle and use exhibits. The main museums also prepare special loan cases of items, illustrations, and replicas for loan to schools or groups of schools.

Children's Agricultural Clubs

Many schools, both urban and rural, establish Agricultural Clubs to encourage children to adopt and care for suitable small animals at home. They are also encouraged to start small home-gardens to learn horticultural science and also to provide food for the home table.

Open Days

The various divisions of the Department of Scientific and Industrial Research (DSIR), the Ministry of Agriculture and Fisheries, the New Zealand Meterological Office, and the Universities hold regular "Open Days", where the general public and school parties are invited to see displays in the various sections, which are explained by the section staff.

Conservation Organizations

New Zealand has long been geolologically isolated from other land masses and has therefore developed unique flora and fauna (i.e. plant and animal species). These have suffered severely at the hands of man especially since European settlement.

Fortunately many organizations have been formed to study and help protect the remaining invaluable life forms as much as possible. Probably the best known and active of these is the Royal Forest and Bird Protection Society, formed in 1920. More recently the Government has established the Commission for the Environment that is already encouraging people, especially children, to study conservation techniques.

Science Fairs

Science Fairs or Science Exhibitions for school children are becoming a world-wide trend. A science fair helps creative abilities of young scientists to be highlighted, and to show how science may be applied to solving the problems of the everyday world. They generate interest, enthusiasm, knowledge and experience in scientific research, both in the participants and in the visitors to the fair.

Wellington, has held Science Fairs for the last 18 years, the first being held in 1964. Auckland held their first fair three years earlier. The initiative for establishing these two fairs came from the local Science Teachers' Associations.

The first hurdle in the case of the Wellington Science Fair was to raise the required amount of finance to fund the fair. A mailing list of the Wellington Manufacturers' Association was prepared and all its members were requested for a donation to help the project. The

rules specified the maximum base size, measures to ensure safety, to avoid annoyance to people, damage to property, and to ensure care of any animals displayed.

Some of the donations from industry were goods, which were used as prizes or to raffle. Experience however showed that business firms have annual budgets and do not always have surplus money to give at short notice.

There are now Science Fairs in sixteen New Zealand centres, in all main centres except one. These would display altogether nearly 3,000 exhibits. In addition some schools are now organizing Science Fairs in their own schools.

New Zealand Science Fairs

For a long time, endeavours were made to organize an Annual New Zealand Science Fair, to display the best exhibits from the local science fairs. This was not achieved until six years ago, because of the high cost of funding them. Fortunately first one, and now a second large international company has fully funded these fairs and assisted with the organizing of them.

The first New Zealand Fair was held in Wellington, the second in Auckland, the third in Hastings, the fourth again in Wellington; the last in Dunedin. The next is being held, in October 1982, at Palmerston North.

Evaluation

Evaluation is carried out on a comprehensive points score system which has proved very satisfactory.

Problems and Issues with Science Fairs

(i) **Funding**
With the early Science Fairs there was more than adequate finance, but with inflation, this has been a little difficult.

(ii) **Venues**
The fairs have been held in public halls, display areas and school halls, moving to a different venue every two or three years.

(iii) **Time**
The best time to hold a fair is difficult to decide : whether to hold it in term time or holiday periods. The Wellington experience has been to hold them in second term holidays.

MALAYSIA

Introduction

Malaysia, being a developing country, needs a lot of new scientists in various fields of research to explore its rich natural resources and to design new techniques to utilize the rich raw materials, for example, rubber, palm oil, cocoa and other agricultural products. These will enable the country to be self-sufficient and also to export more finished products.

More and more new laboratories have been built in schools and new equipment bought for the rural, sub-urban and urban schools. Audio-visual aids have also been introduced in the teaching of science and mathematics. To make the formal teaching of science more interesting and palatable to the science pupils, greater attention has been given to the 'out-of-school scientific activities'. These activities can be classified into two types : formal activities and non-formal activities.

There are various places in Malaysia which offer good sites for out-of-school scientific activities for young people. Some of these are : (i) National Museum; (ii) State Museums (iii) National Park (Taman Negara); (iv) Youth Park; (v) Zoo; (vi) Botanical Garden; and (vii) Aquarium.

Formal Out-of-School Scientific Activities

Most of the activities under this category fall within the rigid school curriculum. The main planners and organizers are the school science teachers.

During the school terms, special science and mathematics programmes are telecast for the primary and secondary schools every week from Monday to Thursday. Schools are given the planned programme in advance. The broadcasts are then followed by a discussion pertaining to the topic observed. This activity is very useful in enriching the teaching of science and mathematics. Some experiments which cannot be carried out in the laboratory due to lack of facilities can be observed in the programme for better understanding of the concepts involved.

In the teaching of Biological Sciences, sometimes the teacher concerned take groups of pupil out of the laboratory to make a practical study of living things in the school compound.

Non-formal Out-of-School Scientific Activities

These activities are organized and planned by the office-bearers of the Science Society under the supervision and guidance of the school science teachers and are organized outside the normal school hours. Some of these activities include visits to factories and research centres, intra-school and inter-school quiz competitions, film shows and excursions; Educational Expo, state and national level science and mathematics competitions, exhibition of local agricultural products by farmers.

In Penang, there is a unique science group known as Penang Young Scientists' Group (PYSG). This group was founded 11 years ago with its members composing of sixth-form science pupils from seven schools on the island. Besides organizing the usual activities carried out by the school science society, they do more elaborate projects of public and scientific interest. During the past years they have carried out projects such as : river pollution with the help of lecturers from the University of Science Malaysia, Penang; noise pollution with financial aid from the Consumer Association of Penang (CAP); a simple analysis of local fruits for their Vitamin C content and some other minor projects.

This group also organizes out-of-state visits to research centres which are not available in the State.

Penang State Inter-School Science and Mathematics Exhibition

The exhibition was first organized by the Association for Science and Mathematics Education, Penang (ASMEP) in the late sixties and was held annually until 1977, after which it was changed to a biannual affair due to lack of manpower; being too time-consuming; and too much strain on the pupils.

The aims of the exhibition are to : promote the non-formal teaching of science; enrich the formal teaching of science; and inculcate and nurture the talents in our young people to be good scientists in future.

The exhibition is organized with the cooperation of the State Education Department. All the state primary and secondary schools are informed of the exhibition about 3 to 6 months in advance so as to give the participants ample time to prepare their projects. A particular school is nominated to host the exhibition.

The exhibition is divided into four main sections – biological sciences, physical sciences, chemical sciences and mathematics. Only fourth-form pupils and above are eligible to participate in the exhibition. As for the primary schools' section, there is no competition among the projects which mainly consist models and charts.

A panel of judges selects the viable and potentially good projects for the exhibition. As a common practices, the Selection Committee will reject any projects which will involve public risk and which torture or ill-treat animals.

Letters of invitation are sent to various institutions of higher studies (RECSAM, teachers' training colleges and universities) to invite their staff of different disciplines to act as judges of the exhibits.

Some of the problems which have been faced in the planning and organizing of the exhibition are the following :

(i) Generally, very few participants are from the rural schools. Even in the urban schools, most of the participants are from the big or relatively established schools.

(ii) Exhibits from the biological section always out-number those from the other sections with the mathematics section always having the least number of exhibits.

(iii) There is a lack of new ideas, with the result that quite often projects which have been exhibited in the previous years tend to be reproduced inadvertantly by the participants.

(iv) Insufficient space for the exhibits. As the exhibition is usually held during the school term, the host school cannot afford to provide too many classrooms for the exhibits otherwise the whole teaching schedule of the school will be disrupted.

PHILIPPINES

The Out-of-School Science Education Laboratory (OSSEL) is an outdoor community research, development, training and demonstration centre where science clubs are given an opportunity to learn, talk and do science in a real-life situation.

OSSEL was conceived primarily as a strategy to test the effectiveness of the out-of-

school science education tools of the Science Foundation of the Philippines (SFP) in the promotion of public understanding of science and technology education, particularly among the people in the rural areas. OSSEL also aims at developing self-reliance and improving the quality of life through science and technology education.

A pilot study was conducted, in three phases, in Dalucuc, which is an agricultural community. First was a cultural survey in 1977, followed by an implementation phase to develop research skills, introduce scientific concepts and principles, motivate the people and transfer technology. The third phase was an evaluation conducted in 1979.

The Field Action Officer took the lead in organizing the science club which became the club of all the science promotion activities of the place. Land owners were motivated to loan their plots of land for various experiments. Workshop-seminars were used to introduce certain techniques and skills.

The evaluation showed that :

1. A positive attitude was developed.
2. A multiplier effect was observed in the neighbourhood.
3. There was an increase in the income.
4. The Science Foundation personnel had a strong desire to concentrate their efforts in the enrichment of this project.

In 1978, a research on "countryside development through science clubs" was launched.

In 1979, OSSEL became a project of the Science Foundation of the Philippines where all forces are centred to realize its objectives for rural development.

The research study aims at determining OSSEL's impact on the community in general. and out-of-school youths in particular. Its evaluation aims to determine the level of productivity among out-of-school youths, the degree of leadership skills, research skills and competencies in terms of their utilization of indigenous resources and scientific methodology for solution of their problems.

KOREA (Republic of)

Out-of-school scientific activities in the Republic of Korea are mostly carried out by the National Science Museum (NSM), which collaborates closely with nine student science centres and two children's centres. The NSM collects, preserves, studies and exhibits materials in the fields of science, technology, industry and natural history in order to diffuse scientific and technological knowledge; promote a scientific way of living; and increase the educational effect of science and technology on young people.

Some of the major activities undertaken by the NSM are :

1. Scientific and technological exhibitions where people can gain first-hand experience with man-made devices and observe the production processes from raw materials to end products of major Korean heavy and chemical industries;
2. Science experiment classes held on week-ends and during school vacations;

3. Micro computer classes providing a basic understanding of computer technology;
4. Week-end science lectures;
5. Science film shows;
6. National science fairs, held annually;
7. Student science invention contests, held annually.

The Government of the Republic of Korea is making all efforts to develop scientific and technological manpower. However, it is difficult to rapidly expand educational facilities across the nation to a satisfactory level. The best short term solution appears to be to establish a "science teaching centre" at the National Science Museum. This centre can be used as an educational establishment for students and teachers. Currently the Government is upgrading the Museum's physical facilities and its programme for this purpose.

SINGAPORE

Introduction

In singapore in recent years, there has been a considerable increase in interest in out-of-school scientific activities. This is because science learning requires time to explore, to experiment, to verify, to apply and to see science applied in everyday life. Science learning in the classroom can perhaps change little from the mainly didactic approach of most teachers because of the demands of the school curriculum.

Out-of-School Scientific Activities for Young People

Out-of-school scientific activities for young people are organized both within and outside the formal system of education. Non-formal out-of-school scientific activities are organized by the following non-formal educational organizations and scientific societies : Singapore Science Centre; Singapore Zoological Gardens; Botanic Gardens; Jurong Bird Park; Coralarium; Van Kleef Aquarium; Maritime Museum; Chinese and Japanese Gardens; Singapore National Academy of Science; Science Teachers' Association of Singapore; Singapore Association for the Advancement of Science; Singapore National Institute of Chemistry; Institute of Physics; Singapore Institute of Biology; and Singapore branch of the Malayan Nature Society.

Traditionally, at least in the earlier years of development of science education, the school science club or science society has served as the focal point of all out-of-school science activities. School science exhibitions, science talks and meeting, visits to science related places (such as industries, power-stations, etc.) were organized to further scientific interests of students outside the classroom and to provide opportunities to both teachers and students to explore areas of science study perhaps not covered or not adequately covered in the normal classroom programme.

Although times have changed, the activities have not. They have been expanded and modified in time with science education innovations and the demands in school science, in the last quarter of a century. What is significant is not only the addition of more activities but also a shift in emphasis, approach and purpose. These out-of-school scientific activities which

now include tinkering with micro-computers, Singapore Youth Science Fortnight, science camps and nature rambles, science project work (like science and technology fairs), quizzes, utilizing what the Science Centre provides, etc., reinforce classroom lessons in science and put a meaning in them.

Apart from the school science exhibitions, there are, at present, permanent exhibitions in non-formal educational organizations such as the Singapore Science Centre, Maritime Museum, Van Kleef Aquarium, Jurong Bird Park and Singapore Zoological Gardens. These exhibitions have attracted an impressive number of students and thus have attained the objective of popularizing science and technology.

Singapore Science Centre

The general philosophy which is followed in the setting up of the exhibits at the Singapore Science Centre is to explain the basic concepts of science and their applications in daily life and industry. It is believed that this is the best way of explaining science and its relevance to daily life to the layman and students.

The exhibits are on pertinent and contemporary issues such as energy, information systems, time, solar radiation, nuclear power, population, genetics, evolution, ecology and aviation. In all, there are over 400 exhibits. The scientific concepts are conveyed in a simple and systematic way through participatory exhibits, live specimens, dioramas, micro-computers, multi-media presentations and video shows. More than 60% of the exhibits involve direct participation. The visitors are allowed to touch the exhibits, turn cranks, push bottons, trace patterns, clap their hands and operate computer keyboards to find out for themselves how scientific principles work.

The exhibits on display are on both life sciences and physical science disciplines. Since the sun is the source of energy and life, the Centre has a series of exhibits on solar radiation in the lobby. This is to make the visitors aware of the importance of the sun as an energy source.

The following exhibit themes are on display in the galleries of the Centre :

Physical Sciences : World of Energy, Nuclear Power, Automotive Engineering, Time, Communication and Information Systems, Universe and Aviation.

Life Sciences : Cell, Human Birth, Population, Genetics, Evolution and Energy.

The Aviation display is one of the latest exhibitions at the Science Centre. It is the largest in the Pacific region and the only one in South East Asia.

The Centre updates and revises about 10% of its exhibits yearly. At the moment, three new exhibit themes are being developed. They are electricity, mathematics and electronics.

Apart from the permanent exhibits, the Centre also sets up temporary exhibitions, each lasting from 3 to 6 months, to attract and keep the layman and students interested in the activities and programmes of the Centre. Guided tours and exhibit workshops are organized to facilitate the maximum utilization of the exhibits.

Singapore Youth Science Fortnight

Since its introduction in 1978, the Singapore Youth Science Fortnight which is jointly

organized by the Singapore Science Centre and the Science Teachers' Association of Singapore, has become a national event with a mass participation by students of all ages. About 100,000 students participate directly or indirectly in the various activities of the Science Fortnight. The activities have successfully attracted the imaginative and creative youths in our society. They have provided them with an opportunity to appreciate that science is a living and dynamic body of knowledge and not a subject where one regurgitates facts and formulae to pass examinations.

Some of the innovative activities of the Science Fortnight include Science Fair, Science Camp, Science Olympiad, Science Circus, Science Fiction Writing Competition, Nature Ramble Competition, Science Fiction Film Festival, Science Stage Show, Science Show and a Science Photo Competition.

New innovative activities are continuously planned for future science fortnights. For the 1983 Science Fortnight, new innovative activities such as Science Telematch, Science Fun Fair and Young Inventors will be introduced.

Computer Appreciation Courses

Some years ago, students tinkered with transistors in the radio receiver. Nowadays, it is the micro-computer or even the mini-computer. Most secondary students now have the opportunity to play with and handle micro-computers in computer appreciation programmes. This allows the students to interact with computers to learn the basic concepts of computer assisted instruction. The number of computer clubs in secondary schools and junior colleges is increasing.

Computer Software Competition

A Computer Software Competition was organized in June 1982 to encourage students to plan their own computer programmes. This competition was the first of its kind in Singapore. More of such competitions will be planned as computers are increasingly used in schools to enhance classroom teaching.

Technology Fair

This biannual competition is planned for students from tertiary institutions such as the National University of Singapore, Singapore Polytechnic and Ngee Ann Polytechnic to undertake independent research-type projects so that they can better appreciate the processes of technology as applied in industry. The Technology Fair, introduced in 1979, aims to arouse the interest of students in the technical fields so that there will be adequate supply of technical manpower to support the various industries in Singapore.

Lecture Demonstrations and Out-of-School Laboratory Courses

The Singapore Science Centre conducts lecture demonstrations and out-of-school laboratory courses throughout the year. Over 30,000 students participated in these programmes last year. They serve to enrich, vitalize and complement the school science syllabus by means of first hand observations and direct hands-on experiences. These programmes are developed

to provide deeper insight, greater understanding and more meaning to those areas of knowledge which usually are merely read and discussed but seldom experienced.

Science Quizzes and Contests

Science Quizzes and Contests, both at school and national levels, are organized for students to gauge their knowledge in the different fields of science. These often help to generate an awareness and interest in science and technology among the student population. Some of these quizzes are telecast over television.

Other Out-of-School Scientific Activities

Other out-of-school scientific activities include forums, seminars, conferences and film shows. These are usually organized by the Singapore Science Centre and the various scientific societies. Contemporary and pertinent topics such as food production and research, man and his environment, genetic engineering are usually discussed. These, therefore, enable the students to understand and keep abreast of scientific and technological developments.

SRI LANKA

Introduction

Learning of science at all levels in the formal school system is mainly confined to classrooms and laboratories operating under the rigidity of formal school time tables which concentrate on preparing students for examinations. Out-of-school scientific activities in Sri Lanka include field trips for ecological studies and industrial visits. Not all students benefit from these out-of-school activities and their organization depends on the initiative of the individual teachers. Science, Radio and Astronomy Clubs, etc. have been functioning in many schools, but again they depend on the initiative of the teachers. It is a matter of some concern that some out-of-school activities have ceased to function in many schools. The excessive emphasis placed on examination success has had a detrimental effect on non-formal out-of-school scientific activities. This, and other problems have resulted in a down-turn in such activities in Sri Lanka. Happily some programmes have not only survived but they have prospered.

Field Studies Centres

This programme is operated by the Policy Co-ordination Branch of the Ministry of Education, and at present seven such centres are functioning under this programme. Centres are located in very rich natural environments which provide rich resource material for out-of-school scientific activities. The environments are a forest, a river, a seashore or a lagoon. The seven Field Centres are sited in different parts of Sri Lanka in different environmental locations.

The main objectives of the Field Studies Centre Programme are : the use of environment as a resource for learning; development of resource centres for environmental studies; promotion of "living in" camps, where youths live together and participate in scientific

activities; to make it possible for young people to work together with their teachers; the conservation of nature; to encourage young people to embark on scientific enquiries; and to encourage use of libraries, museums and the open environment for acquisition of knowledge.

At the Field Study Centres, youths live and work together with teachers and experts. Senior science teachers, university academic staff and officers from research institutes provide the expertise for such camps. This programme is gaining in popularity and more Field Study Centres are envisaged in the near future.

Rural Schools Science Programme

Students following the junior secondary education programme in rural schools lacking adequate equipment facilities, mainly participate in this programme. Batches of 30 – 40 students together with their teachers visit the Centre on a pre-arranged basis. The students learn to use equipment not available in the schools and gain experience which complements and reinforces their formal science education. The students also make use of the environment of the Field Centre as a resource for their science learning. The students work in groups at their own pace guided by their own teachers and the Director of Studies and are engaged in a programme of self-evaluation.

Fieldwork Programme in Ecology for G.C.E. (Advance Level) Students

Biology students from schools with G.C.E. (Advance Level) classes book the Centre for a day or two and do systematic ecological survey of the environment using standard ecological equipment under the guidance of their teachers and the Director of Studies of the Centre. A fieldwork guide, a Herbarium, identification keys, a museum and library are used as source materials in addition to the natural environment.

Residential Camps for Youths

These are organized at District, National and International Levels on themes of current interest to the community and the nation. Some of the themes of the camps organized are "Green Revolution", "Pollution", "Alternate ways of obtaining energy and conservation of energy", "Pests and Pest Control", "Better Utilization of Palmyrah Plant", "Electronics" and "Astronomy".

At these camps 30 – 40 youths live together at the Centre for 4 – 5 days and work on the theme for the camp guided by Science Teachers and Experts. Promising students are selected during the camps to continue the projects evolved at the camp or similar projects for a period of one year. This aspect of scientific enquiries by youth is described in detail below.

Scientific Enquiries by Youth

Keener students who have gained markedly from these camps are awarded a monthly honorarium to partly cover incidental expenses incurred by the recipient for the continuation of their project. Such students register themselves with the Research Council, a sub-body

under the Fieldwork Centre along with the outline plan of the project proposed. The Research Council assigns to this student one or more resource personnel, who are experts in the field of study selected by the student. Such students work in advanced laboratories in Research Institutes also and submit monthly progress report to the Research Council and a final report on completion of the project.

Typical advanced themes have been "Pollution", "Pests and Pest Control" and "Conservation of Energy". This year two youths are working on "Better Utilization of Palmyrah Plant".

Involvement of Youth in Community Oriented Projects

Some members have been working on community oriented projects to help in the improvement of the living standards of the community living around the Fieldwork Centre. Some of these programmes already worked on are 'prawn culturing in floating cages' and 'non-traditional ways of preservation of agricultural products'.

In these programmes students were made to assist research workers and thereby gaining scientific expertise.

THAILAND

Several scientific activities, both in school and out-of-school, have been organized in Thailand. Some of these are : science clubs, science camps and excursions, temporary and permanent exhibitions, radio broadcasts, mobile units, a Discovery Room, mathematical games, Toy Corner, Toy Library, and T.V. shows and contests. Many of these activities are carried out by the Centre for Educational Museums. The basic approaches used for promoting these activities are :

1. Self-learning approach;
2. Environment of equal opportunity and freedom of choice;
3. Integration of science and culture in every activity.

Some of the major problems that hinder the success of learning science may be the results of the following :

1. Students' unfavourable attitudes towards science;
2. Too serious an atmosphere in a science class;
3. Students' lack of basic skills essential for science learning.

Besides the improvement of teaching methods and course contents, the success of science learning depends on the promotion of students' favourable attitudes towards science, and the feeling that anyone can learn science. The answers to these problems may be to :

1. Give the children an opportunity to play with toys that promote systematic thinking;
2. Arrange special activities on scientific experiments which are easy and enjoyable;
3. Organize educational excursions to build scientific interest and discoveries.

In an attempt to solve some of the problems, the idea of a "Discovery Room" was

conceived. It is a room where the young visitors can practise solving problems and freely acquire scientific skills. All necessary materials and instruments are provided in such a way that participants can experiment and find out solutions by themselves. Instructions, answers to each exercise and evaluation procedures are also prepared for their use. It is hoped that the Discovery Room will give the children and those interested in science an opportunity to have fun with scientific toys, to gain some scientific insight and to introduce them to scientific skills.

Apart from the Discovery Room, the Science Museum provides :

1. The Mathematics Corridor, where a number of mathematics games can be played;
2. The Toy Corner, with educational and scientific toys which many children may not be able to obtain themselves because of the high costs;
3. Mobile Units (starting in 1982). This is an idea of moving science museums to isolated provinces in the country;
4. Radio correspondence programme, with registered members. These are designed for the rural people, and provide an opportunity for the members to visit the Museum free of charge. Small courses and applied science courses are also arranged for members.

Summary of Current Trends

Over the past ten years there has been a growing awareness in all countries represented in the workshop, of the value and power of out-of-school scientific activities. One example of this awareness is reflected in the number of science centres and museums which have steadily appeared in the Asia and the Pacific region in recent years. The number of people who have access to such centres is, as a result, also growing steadily.

Not only have such centres sprung up, but there has been a trend towards the development of a greater number of hands-on type exhibits. It is evident from the reports that participatory exhibits are the ones which best capture the imagination and stimulate a sense of curiousity in the visitors. It is seen as vital that this trend is encouraged, and in countries where it has not yet really taken off, that it be helped to begin.

There is no doubt that out-of-school scientific activities are playing a very important role in bringing some form of education to the people. Such activities are benefiting far more people than the title 'out-of-school activities' might suggest. The trend has been, and should continue to be, to bring some education to the vast majority of people in the region who have never had, and never will have, the luck to receive a formal school education. It is therefore appropriate that a major trend has been the tailoring of out-of-school activities to the needs of the people who will never go to school, rather than the fortunate few who do.

Out-of school activities in many countries are tending more and more to be concerned with solving problems of the rural community. They are not primarily concerned with the dissemination and assimilation of scientific facts, but rather the application of science and technology to tackling real-life problems in the country.

There has also been a trend to the greater utilization of secondary and tertiary school students in out-of-school scientific activities. Such students, who have received some formal education, can, and have been trained to assist in programmes on a voluntary basis. Not only have they been able to make a valuable contribution to the dissemination of scientific knowledge, they gain themselves in a deeper understanding of their countries problems and needs.

The emphasis and direction of science clubs has also been progressively changing. A few years ago they mainly concerned themselves with presentations, model making and constructing and performing experiments. The trend now appears to be that they are directing their efforts more towards carrying out projects which are relevant to the community in which they live. In these reports there are several examples of communities gaining great benefit from the activities of science clubs.

Another important recent trend is that more and more of Regional and International co-operation and collaboration are coming up in the field of out-of-school scientific activities which has resulted in a more wider exchange of experiences and insights.

Overall, it would appear that the trend is towards making greater efforts to make science and technology more interesting, exciting, attractive and perhaps most important of all, relevant.

Problems Facing Out-of School Science Activities

The largest problem of all facing most countries represented at this workshop is the sheer enormity of the task of trying to design programmes which are within the reach of the majority of the potential users. There are precious few people who have the appropriate training, and, perhaps more importantly, the necessary motivation, to pursue such programmes. While the numbers of suitable leaders in this field remains small and perhaps static, the number of consumers is rising at a terrifying rate.

It is therefore seen as absolutely essential that in all countries education programmes are established to train suitable people to be capable of developing so-called out-of-school activities. Moreover it is necessary that such programmes be initiated without delay, in that the need for it is becoming more serious by the day. This is to ensure that there will be enough scientific programmes to cater for the problems of a fast increasing population.

In many countries the task of implementing out-of-school scientific activities is made more difficult by language problems and various cultural aspects. The former can be overcome in time by training sufficient people who are proficient in speaking the necessary languages and dialect. However, obstacles imposed by various cultures are far more difficult and time consuming to overcome or circumnavigate.

A problem which is more immediately solvable is that of identifying the real needs of recipients before designing and implementing a scientific programme. If care is not taken at the start of a project to do this, it could well be doomed to failure.

The vast geographical areas which are involved in some projects demand appropriate transport and methods of communication and these are expensive and usually not available.

This, however, is a problem which is capable of solution, for here help can be sought from various agencies both internal and external to the country in question.

In developing out-of-school scientific activities, it is essential to organize the co-operation, and optimization of resources in all the various agencies involved in the programme. In this endeavour, the project can stall because of deliberate obstruction and petty jealousies and such problems can only be overcome by careful and tactful leadership. Here again is highlighted the need for leaders with training and understanding.

A problem facing all countries in the region, both developed and developing, is that of finance. There are a number of ways this problem can be approached. Assistance can be sought from internal and external agencies to the country of origin. In addition, funds can be obtained from industry, but, ironically, it is in the countries where it is most needed, that the industrial concerns are least interested in promoting their corporate image. It is clear from the reports of the various participants to this workshop that one method which is being adopted to alleviate the financial problem is to encourage programme leaders to make more and more use of existing community expertise, resources and indigenous materials.

Chapter Three

PLANNING, ORGANIZATION, AND EVALUATION OF OUT-OF-SCHOOL SCIENTIFIC ACTIVITIES— SUGGESTED GUIDELINES

Based on the experiences shared in the Workshop and taking into account the various emerging trends, problems and issues which are being faced by the organizers of various out-of-school scientific activities in the participating countries, the Workshop formulated a set of following guidelines covering these three aspects.

PLANNING ASPECT

How important the planning process has become for most of the countries participating in this Workshop is simply demonstrated by the fact that all these countries have their national development plans and education forms an integral part of these national socio-economic development plans. It is through this process of planning that the countries are attempting to get maximum results out of the limited resources dispersed in the country and which are available for various developmental tasks.

A. Rationale

Both for developed and developing countries, science and technology are recognized to play a key role in their overall development process. However, to derive a maximum benefit from science and technology, it is essential that one develops a minimum scientific literacy and scientific temper within its communities.

A minimum of scientific literacy can mean different things at different times, depending on the target groups for which the out-of-school scientific activities are organized. This will include all the three aspects, namely knowledge (facts, information); skills (mental and manipulative); and last, but not the least, attitudes and values. It is this last component which can, hopefully, be best achieved in an out-of-school environment which has no boundaries of the formal, rigid in-school science learning. The development of suitable indicators, which many a time will have to be micro-local-specific, to determine what scientific literacy has been achieved through a particular set of activities will need to be considered in the planning process as well as to conduct various evaluative exercises.

To harness science and technology we must take into account the problems of resources, population, literacy and co-ordination and collaboration at various levels amongst the relevant institutions and organizations, both horizontally and vertically. In this respect one should

not forget the role played by the local potential leaders, inter-personal media and folk culture if one wants to achieve maximum outcomes.

B. **Need for Identifying Target Audiences**

The various reports presented to the Workshop indicate that a variety of out-of-school scientific activities are being organized through many types of institutions and organizations and many a time, the same activities try to cater to different target groups, with the result that it is difficult to derive maximum benefit out of the activities. It is therefore desirable that for the planning of activities one should clearly identify the different target groups so that while organizing the activities, they could be specifically focused to the needs, interests and levels of the various target groups.

Looking at the activities which are currently being organized in different participating countries, the Workshop suggests that the following target groups could form one possible and feasible arrangement for planning of various out-of-school scientific activities :

1. **The formal school population** : For this group the out-of-school science activities can help, enrich, supplement and complement school science education programmes in achieving to a more appreciable degree its stated objectives.
2. **Out-of-school youth and adults** (early drop-outs, illiterates, work force) : Here the activities could serve as a vehicle for developing scientific literacy and creating the needed scientific climate.
3. **The 'educated' youth and adults** : The activities could be seen as part of a life-long education for adjustment to the fast and vast changing socio-cultural and economic conditions as a result of scientific and technological progress and changes.

C. **Identification of Needs of Various Target Groups**

The Workshop believes that all out-of-school scientific activities and programmes must be planned and developed based on the identified needs, interests, real-life problems and concerns of the various target groups. Some of the needs are apparent and of a regional nature such as population control, fighting malnutrition, increasing agricultural productivity and improvement of livestocks, health and sanitation, all of which have a scientific and technological component. Some of the other needs could, however, be very specific to certain communities and geographical locations. It is felt that if the activities take into account these aspects, the chances are that the target groups will be more motivated and activities will become more participatory in nature, a trend which many of the activities are trying to follow.

Once the needs of the various target groups have been identified, priorities will have to be determined for organizing activities and this will be dependent on the available resources – physical, financial and human. Other aspects will be feasibility, attainability and socio-cultural acceptability.

In order to identify the needs and to ensure that they are the real needs of the target groups, a cadre of people will have to be properly chosen and trained so as to be effective in

communications and reach the various target groups, gain their confidence and help them to articulate in listing their needs. This action will often demand sensitizing the populace, particularly the rural poor and disadvantaged groups, to help them know what they really need. The role of out-of-school scientific activity organizers and sponsors therefore becomes very crucial in this regard.

D. Optimum Utilization and Development of Infrastructures—Co-ordination and Co-operation

The various participant reports showed that a number of Ministries and Departments of the Government, many private and public agencies, voluntary organizations and individuals are engaged in the organization of out-of-school scientific activities. It is, therefore, very necessary, specially in view of the scarcity of resources in most of the participating countries for such activities, that an optimum utilization is made of the available resources, facilities and expertise interspread in various places. In order to achieve this, it is necessary to develop a mechanism for interministerial co-ordination and co-operation.

Not only this, there are many problems of even intra-departmental co-operation. Co-ordination and co-operation will be needed both horizontally and vertically and at all levels. To achieve this, it will be desirable to either develop a new infrastructure for this purpose or utilize an existing infrastructure which could work as an effective apex body at the national level and also similar bodies at the regional, provincial, district or city levels.

It is heartening to note that during the last decade, many of the participating countries have now established a national science and technology museum or national science centres, and in some countries with linked science museums at provincial levels. Keeping this in view, the Workshop suggests that in the present scene, the Ministry of Education and the National Science and Technology Museum appear to be in a better position to take up the responsibility of such a co-ordinating and planning body for out-of-school scientific activities which may be organized by the institutions within a country.

E. Nature of Activities

Though it may not be possible to plan and design a programme of out-of-school scientific activities which may neatly cater for the specific needs of the individuals or a particular target group, yet recognizing that in any target group, there are different levels of needs, interests and development and to ensure that the activities motivate and enable the target groups to actively participate in them, it is desirable to plan the activities in a graded manner. For this purpose, the following 'hierarchy of activities' is proposed :

a) Simple science and technology information;
b) Simple observation;
c) Collection;
d) Classification;
e) Duplication (modelling);

f) Experimentation with real problems and felt needs;

g) Inventions.

It should be recognized that even though the activity may be in the category of simple observations, yet it can have both the elements of education and creativity. The hierarchy will also enable different participants to move at their own pace and according to their own interest from one set of activities to the other.

F. Supporting Communication Needs

Because of the scattered target audiences, communication is vital amongst these. The following may be considered : newspapers, periodicals, scientific journals, pamphlets, slogans, brochures, radio, television, audio and video-tapes. The effectiveness and efficiency of the utilization of these media depend on local conditions, such as geography, transport, distance and other available facilities.

In the context of the Asia and Pacific scene, another important labour and human-intensive mode of communication, particularly in the rural areas, is the inter-personal form of communication and a variety of folk media which can be very profitably harnessed in supporting the out-of-school scientific activities and promoting a scientific climate and temper.

Each media has its own uniqueness and therefore planning should include training of necessary manpower to cater for the demand of various media and also development of softwares.

Encouragements for a continued innovation should be provided for in any planning. However, the planning process should not be seen as a one-shot or one-time affair, but would need constant review and revision based on an evaluation of various activities. Suggestions for obtaining the feedback from an evaluation are given in the latter part of this Chapter.

ORGANIZATION AND IMPLEMENTATION ASPECTS

The Workshop felt that the word "implementation" was a more appropriate word in this context than the word "organization". The point was made that there are several different types of organizations which can implement a particular activity. In some cases the organization can be formally established and constituted by a government department. Typical of this type of organization are science centres and museums.

In other cases, however, the activity may have emerged from a "grassroots" beginning and is not formally constituted. It may not in fact be initiated by a committee, but by a single individual within the community.

No matter what the form of organization, it will be necessary for anyone involved in the implementation of an activity to consider a whole range of factors. For instance, no matter what form the organization takes, it will have to give careful consideration to the financial aspects of the programme.

This Workshop has attempted to identify a range of factors which any organizer should consider when establishing an out-of-school scientific activity; however, it must be stressed

that (a) the list is not exhaustive, and (b) the factors identified will not necessarily be relevant to all projects.

The list is meant to serve merely as a **source** which any organization can draw upon in the implementation of their particular programme. It has been compiled from the experiences of a group of people who formed a sub-committee who themselves had all initiated and conducted projects in Asian and Pacific region.

In summary, the list is not seen as exhaustive, but rather a useful starting point for the implementation of the project; a checklist, from which an initial blueprint for the project can be assembled.

Indentification of Major Areas Concerned in the Implementation of an Out-of-School Activity

The Workshop recognized the following topics as important to the setting up and development of an activity. The relative importance of a particular topic will naturally depend on the activity under consideration.

A) Finance and budgeting
B) Transport
C) Community involvement
D) Co-ordination and liaison with other organizations
E) Administration and overall co-ordination of project
F) Use and involvement of the media
G) Publicity and public relations
H) Liaison with school and local education authorities
I) Involvement with families – parents and grandparents
J) Involvement of industry and commerce
K) Public liability – insurance
L) Obtaining equipment and materials
M) Accommodation for the project

Having compiled this list, the Workshop went on to discuss what were considered to be the most important of these factors, which is not necessarily in the order indicated above.

1. **Financial Planning and Production of Budget**

In every project, it is anticipated that it will first and foremost be necessary to prepare a budget. A budget will serve not only as an indication of the overall magnitude of the financial involvement, but will also provide a list of the component parts of the project.

The following list, while not being exhaustive, will serve to highlight some of the possible areas of expenditure.

1. Cost of accommodation
2. Transport
3. Printing/duplication/stationery

4. Staff
5. Graphic design
6. Heat/light/power/fuel
7. Postage
8. Insurance
9. Purchase of equipment (non-expendable)
10. Purchase of materials (expendable)
11. Telephone
12. Photocopying
13. Cost of prizes
14. Travel expenses
15. Hospitality
16. Publicity
17. Photographs/audio-visual
18. Donations

It must be stressed that right at the outset of any out-of-school activity, contact should be made with international and regional organizations concerned, such as Unesco and its regional offices, ICC and UNICEF. These groups in many cases can provide those organizing out-of-school scientific activities with valuable information : materials, textbooks and even in some cases, financial assistance. This last possibility is usually achieved jointly by one of the international institutions and the government of the country concerned.

Finance is undoubtedly the most important facet of any project and is usually provided by some government agency. It can, however, be supplemented by money from the private sector : industry, community organizations, banks and self-generated income.

Industry can be encouraged to contribute, providing they are able to see that the project is a vehicle for improving their own corporate image, and that the project is of some clear benefit to the community.

One useful tactic which has been employed successfully has been that of organizing a function at which some well-known personality (e.g. regal or high-ranking politician) and industrialists are invited to attend together. The opening ceremony to an exhibition is a classic example.

Other sources of income can include : admission charges, sale of scientific-based articles and refreshments.

2. Community Involvement

There are many community-based organizations which can be successfully approached for financial (and other) support provided it can be demonstrated to them that : (a) the project is of real value to the community; and (b) that they can be clearly identified with the project and its success. Organizations like Rotary International, Apex, Lions, Jaycees and local Chambers of Commerce are examples of organizations which could be approached.

Some museums and science centres have established groups with the title "Friends of the Rakasia Science Centre". Such an organization can be valuable, not only in providing a regular source of income from subscriptions, but, if carefully selected, can act as ambassadors within the community, who will themselves attract further support.

3. Recruitment and Training of Staff

This is generally the most expensive aspect of any project and many activities in the past have therefore relied heavily on volunteers, both old and young.

One or two heavily committed and highly skilled persons can train a host of students, both secondary and tertiary, to run projects. In such an endeavour, retired professionals in the community should not be ignored for they may well be prepared to continue to work in the service of their country after their formal working life has come to an end. In many projects, it may well be possible to enlist the services of teachers and university academics during formal teaching vacation periods.

It must also be pointed out that in many countries, the training of staff for out-of-school scientific activities is already being carried out in a formal manner at the university level. Where this is not done, efforts should be made to persuade the appropriate education departments to consider setting up such a programme.

4. Publicity and Public Relations

This can be a vital part of any project, for in many instances the project may fail, simply because the community at large is not fully aware of the aims and objectives of the activity concerned.

One tactic is to talk to organized groups within the community, e.g. church and religious groups who are committed to community service.

Other methods are press releases, posters, brochures, radio and television announcements, and audio-visual presentations like video cassettes and slides.

The staging of exhibitions can also be valuable, e.g. Science Weeks. Other example would be to stage an exhibition on, say, "The Energy Crisis", and persuade concerned firms not motivated with profit designs to become involved.

5. Administration and Overall Co-ordination

For a project to be successful, it is felt that a real team effort is essential. There is a need for continual briefing sessions, both horizontally and vertically within the organization. It is vital that everyone in the organization should be well acquainted with the direction and purpose of the project.

In achieving this, human relations play a vital role, and it is seen as essential that the director of the project provides the necessary inspiration and motivation which will result in the project proceeding in the right direction. This will be best achieved by regular consultation rather than an autocratic approach.

The point has also been made that the organization will project into the community much of its own feelings. If it is content, enthusiastic and has a sense of common purpose, this will be felt beyond its confines.

6. **Co-ordination and Liaison with Other Organizations**

This can be quite an important aspect of a project in that it can avoid the possibility of the organization "inventing the wheel", thus expending valuable effort to no purpose.

It is also possible that with the appropriate liaison, much mutual benefit can be obtained. More well provided-for organizations in the vicinity could well provide help with printing, duplicating, photocopying, audio-visual aids, staff, etc.

Existing organizations can, if correctly approached, be the "launch-pads" for other less well-provided for projects and activities.

7. **Accommodation**

There are many possibilities here, depending on whether the activity is long term, short term, intermittent or permanent.

Schools, colleges and universities can provide space during vacation periods. Out in the community at large, it is possible to seek the use of community centres, shopping malls, and in remote areas, large tents can be used, which could be borrowed.

8. **Liaison with Schools**

Such liaison has many obvious advantages, not least the fact that schools can provide accommodation, staff and equipment to develop projects.

It is also essential that the formal educational systems appreciate the purpose and value of the particular out-of-school activity, in order that they know how best to make use of it in their own formal programmes.

9. **Involvement of Parents**

It is vital to keep both parents and grandparents fully informed about the aims and objectives of the project. Where this is done, the endeavours of the particular out-of-school activity may well be continued beyond its confines back into the home. Informed parents can become committed parents, and as such may well be able to lend, provide or incite assistance.

10. **Involvement of Industry and Commerce**

The sentiments of the Workshop regarding this particular aspect – which can be very significant – were largely expressed earlier in Section 2, Community Involvement.

Let it only be stated here that enlisting industrial/commercial support can be very time-consuming, but if approached in a correct way, it can be very rewarding. What the "correct" way is determined by the activity and the type of approach to the firm concerned.

Industry and commerce can provide : financial assistance; production of exhibits; and financing exhibits.

Conclusion

The Workshop concluded that the method of implementation was at the very heart of any project and therefore of critical importance to its success. It was also vitally important that all members involved in running a project should be totally committed and all striving to the same common goal.

Identification of Major Components in Designing an Out-of-School Science Activity

An interesting technique was developed in the course of the Workshop which it is felt could be of value to the leaders of future out-of-school science activities.

The technique involves making two lists and completing a chart. The first task is to list all factors which will be involved in the implementation of the programme.

A) Finance and budget
B) Transport requirements
C) Community involvement
D) Co-ordination and liaison with other organizations
E) Administration
F) Involvement of media
G) Publicity and public relations
H) Liaison with schools
I) Involvement of parents
J) Involvement of industry
K) Public liability – insurance
L) Purchase of equipment
M) Staff recruitment and training
N) Accommodation for project

The next task is to list all possible areas which will involve financial expenditure.

1. Accommodation
2. Transport
3. Printing/duplicating/stationery
4. Staff
5. Graphic design
6. Heat/light/power/fuel
7. Postage
8. Insurance
9. Purchase equipment
10. Materials purchase
11. Telephone
12. Photocopying
13. Cost of prizes
14. Travel expenses
15. Entertainment
16. Publicity
17. Photography/audio-visual
18. Donations

Once the two lists are prepared, then a chart is prepared as indicated on Page 41.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Totals
1	✓												✓	✓	3
2	✓		✓	✓	✓	✓						✓	✓		7
3	✓		✓	✓	✓		✓	✓	✓						7
4	✓	✓			✓		✓	✓	✓	✓		✓	✓		9
5	✓						✓	✓						✓	3
6	✓	✓													3
7	✓		✓	✓	✓		✓	✓	✓	✓		✓	✓		10
8	✓	✓	✓								✓		✓	✓	6
9	✓	✓												✓	3
10	✓													✓	2
11	✓		✓	✓	✓		✓	✓	✓			✓		✓	9
12	✓														1
13	✓		✓												2
14	✓			✓	✓			✓		✓		✓	✓		7
15	✓		✓												2
16	✓		✓	✓		✓	✓		✓	✓			✓		8
17	✓		✓				✓								3
18	✓		✓			✓			✓	✓			✓	✓	7
Totals	18	4	10	6	6	3	7	6	6	5	1	5	8	7	

The financial components of each factor is then indicated by ticks in the vertical column under a letter corresponding to that particular factor.

For example, Transport requirements (B) is a factor which is seen as involving staff (4), fuel (6), insurance (8), and spare parts (9) to keep the vehicle operational.

Once completed, the chart will provide the following information.

The horizontal totals give an indication of the most important components for the factors list. For instance, postage, telephone and publicity are relevant to a large number of the implementation factors. It is significant that they are all methods of communication.

The vertical totals indicate the relative costs of the various factors. For instance, the most "expensive" factor, at least in terms of time, is the budget and its preparation.

From the chart, we also discover that community involvement and staff recruitment and training are considered to be amongst the most expensive factors in the programme.

Clearly, the way in which the chart is completed will vary from project to project. In some cases, for instance, the organizers may well have the full use of a telephone and there may be no printing and duplicating costs. In that case, the chart given here as an example would be considerably different.

The idea and technique is one excellent example of the sort of benefit which can be derived from a workshop of this kind where a series of people come together to share ideas and philosophies.

EVALUATION ASPECTS

In every activity, evaluation plays an important role, since it helps in making modifications which steer the programme to the ultimate achievement of its objectives. Such modifications will normally have the effect of utilizing the available funds and facilities more effectively.

The evaluation of out-of-school science and technological educational activities is principally used, not for its discouragement, but for its improvement.

Many out-of-school science activities for youth are done purely on a voluntary basis and therefore exaggerated criticism or the lack of tact when comparing projects in various parts of a country, could lead to the dampening of organizers' enthusiasm.

One of the principal components of an evaluation programme should be self-evaluation. However, in order to achieve the best results, clear objectives and aims of the activity should be identified and formulated according to the local needs. The strategies for implementation must also be identified.

The principal objectives of out-of-school science and technological education could be formulated as follows: "To create an overall sympathetic attitude and appreciation of science and technology as one of the principal tools for national development".

The principal needs and strategies are as follows :

1. To link out-of-school science and technology education to current social problems, e.g. agricultural and industrial development, environmental protection, etc.;
2. To institutionalize out-of-school science and technology education while at the same time trying to ensure that the programme is flexible;
3. To create meaningful and functional relationship with relevant government and non-governmental agencies and organizations;
4. To train adequate numbers of personnel to lead and advise science clubs, museums, fairs, camps, etc. and to promote an efficient communication, information and documentation service for out-of-school science and technology education at the local, regional and national levels.

During the evaluation process, the following important general functions of the out-of-school education programme are also to be borne in mind :

1. A supplementary service to formal science and technology education. This means to complement, replace and reinforce it through out-of-school programmes.
2. Providing second chance for all those children, adolescents and adults who failed to take advantage of their initial educational opportunities, dropped out and did not reach the adequate level of scientific literacy. It is true that many people only develop an interest for science and technology when they reach a mature age, and for such people, non-formal out-of-school scientific activities are their only means of improving themselves.
3. Providing the initial educational opportunities for the large sections of non-enrolled school-age children, adolescents and adults who for one reason or another had no opportunity to profit from systematic science and technology education.

In the background of the objectives, needs, strategies and functions of out-of-school activities for science and technology education listed earlier, the different aspects which should be evaluated are as follows :

1. To determine if the participants really understood the purpose of the activity and whether they learned from it;
2. To determine if an awareness in the general public had been created and also in the scientific and technological education organizations concerned about the project and what it was trying to achieve;
3. To determine what achievements had been made by the various agencies involved in the project.

In addition, it was considered important, in the evaluation of any project, to cite facts and figures.

Science Clubs

1. Extent of enrollment;
2. Maintaining of interest among members in the club activities (i.e. was there a drop-off in membership?)

Science Fairs and Exhibitions

1. Whether activities are science-based;
2. Whether activities are linked to the country's needs;
3. Are programmes educative?
4. Are the programmes innovative?
5. Do the programmes promote creativity?
6. Are local resources utilized?

Science Museums

1. Linked with national heritage, environment and national needs;
2. Depict development of national technology;

3. Its influence on the community;
4. Its activeness and the extension and co-ordination activities;
5. Comprehensiveness of the programmes;
6. Special attention to be paid to mobile exhibitions and museobuses, in view of the fact that in some cases, the cost of such programmes do not correspond to the effects achieved, especially concerned with regional and international mobile museums.

Science Camps

1. Awareness of community problems among the clientele;
2. Reaction of community towards such programmes;
3. Cultivation of scientific skills and scientific interests;
4. Effectiveness of the programmes and the relaxation provided for the participants;
5. Promotion of scientific expeditions (summer camps).

Science Olympiads, Tournaments and Quizzes

While evaluating these programmes, it should be borne in mind that the "competitive spirit" of the events do not overshadow the objective of selection of participants and their voluntary and joyful participation in the events.

Mass Media

The mass media can play a vital role in improving out-of-school science and technology education. However, in evaluating its effectiveness, it is really only perhaps possible to find out how much the media know of the project, and to determine and describe the extent and effectiveness of publicity given to the project.

Conclusion

The Workshop considering evaluation techniques, summed up the various possible approaches as follows :

1. Informal discussions and feedback;
2. Questionnaire;
3. Formal reports citing facts and figures;
4. Surveys and comparative studies;
5. Workshops and meetings.

Evaluation could be done by :

1. The agency conducting the out-of-school programme;
2. The co-ordinating agency – at international, regional and national levels.

Chapter Four

SUGGESTED OUTLINE FOR A TRAINING HANDBOOK FOR KEY PERSONNEL ORGANIZING OUT-OF-SCHOOL SCIENTIFIC ACTIVITIES

Introduction

The experiences shared by the participants during the Workshop amply demonstrate that there has been a very rapid proliferation and expansion of out-of-school scientific activities in almost all the countries. Not only that the activities have increased in numbers covering a wide spectrum of the populace, but even the nature of activities has undergone transformation.

Organization of such activities was originally the preserve of a handful of dedicated and motivated individuals. However, due to the fact that there has been a very rapid increase in such activities, many more people are now required in order to fulfil the increasing needs.

The task of finding and training new people to fulfil the demand will not be easy, especially as the problem is compounded by time constraints.

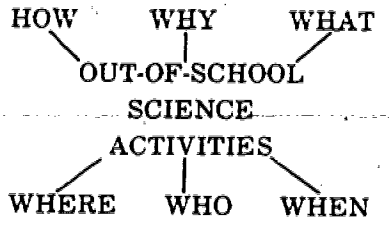
Each country has its own specific problems and attempting to establish a single format training programme would not be feasible or effective.

In some cases, training programmes can be informal and self-taught, or organized structured in-service courses or, in certain cases, even part of a pre-service programme particularly for science teachers.

It is therefore felt that only the basic guideline should be set down for the use of all, and that this would be best achieved by the production of a training handbook.

The purpose of this handbook would be to offer guidance and experience for such people in the planning, implementation and evaluation of out-of-school activities.

In order to develop an outline of the contents of such a training handbook, the Workshop used the following scheme for the purpose of its discussions :



The question of "WHY" will have to be looked into in terms of the rationale for and the role of out-of-school scientific activities. The "WHAT" aspect should be addressed in terms

of the planning needs for such activities. The "HOW", "WHEN" and "WHERE" will be the implementation aspects. Finally, the "WHO" component relates to the key personnel who will be responsible for organizing and evaluating such activities. In addition to this, "WHO" could also encompass the target audiences.

In order to provi an answer to these questions, the Workshop suggested the following outline for the training handbook :

Chapter One—An Introductory Chapter : This should include the rationale for developing and implementing the out-of-school activities; their advantages over the formal school science education programme; nature and scope of such activities and their limitations.

Chapter Two—Planning for Out-of-School ScientificActivities : This should include concerns such as need for planning and its advantages; macro- and micro-level planning of such activities; perspective planning; determination of needs of the clientele; resource identification and mobilization; locating unused and under-utilized resources; staffing needs, etc.

Chapter Three—Implementing Out-of-School Scientific Activities : This chapter could include the problems of implementation and possible strategies to overcome such problems based on the guidelines which the Workshop has proposed under Chapter Three of this report. Skills in effective and inter-personal communication, group dynamics, human relations, motivation are some other aspects to be covered.

Chapter Four—Evaluating Out-of-School Scientific Activities : This could briefly describe the need for evaluating activities as a mechanism for renewal of a programme and correction of the courses. A short description of different evaluation techniques and instruments with their limitations in view of the peculiar nature of out-of-school scientific activities could be profitably included.

Chapter Five—Special Characteristics of Selected Out-of-School Scientific Activities : This chapter could deal with the special characteristics of the following major out-of-school scientific activities facilities :

a) Science and Technology Museums/Science Centres (at national, sub-national and local levels);
b) Science Clubs (as part of schools or independent clubs);
c) Science Camps/Field Study Centres;
d) Science Fairs and Mobile Exhibitions;
e) Popular science writing; and other media programmes – radio, TV and films.

Under each of the above five, could be indicated the role of the organizers of these activities and what competencies they need to acquire. It is recommended to have some short case studies of successful projects included as examples (from the developed countries, the developing countries and the least developed countries) so as to provide the readers of the handbook with a variety of problems and strategies adopted for their solution.

The Workshop recommended that the handbook should be basically a practical document illustrated profusely with actual examples wherever possible.

The handbook could also include some Annexes, particularly a bibliography on out-of-school scientific activities literature; and an inventory of out-of-school science programmes in the various countries of the region and addresses of national-level science museums and important projects.

Annex I
List of Participants

Australia

Dr. M. Gore
Department of Physics
Faculty of Science
Australian National University
P.O. Box 4
Canberra, ACT 2600

Bangladesh

Dr. Mubarak Ali Akhand
Director
Museum of Science and Technology
95 Kakrail, Ramna
Dhaka - 2

China (People's Republic of)

Mr. Wang Jingsheng
Deputy Director
Department of Children and Teenagers
China Association for Science and Technology, Friendship Hotel
Beijing

Mrs. Di Xiaojing
c/o Secretary General
Chinese National Commission for Unesco
37, Da Mu Chang Hutong
Xidan, Beijing

India

Dr. P.K. Khanna
Reader in Botany
Regional College of Education
Shyamala Hills
Bhopal 462013

Indonesia

Dr. B. Suprapto
Director
General Secondary Education
Ministry of Education and Culture
Jakarta

Malaysia

Mr. Tan Get Joo
Adviser of Penang Young Scientist's Group (ASMEP)

61 Medan Kolam Air
Reservoir Garden
Air Itam, Penang

Nepal

Dr. Purna Nath Mishra
Chief
Natural History Museum
Tribhuvan University
Anandakuti, Swayambhu
Kathmandu

New Zealand

Mr. Phillip Alve
Secretary
Willington Branch of the Royal Society of New Zealand
52 Raroa Road
Kelburn
Wellington 5

Pakistan

Mr. M. Akmal
Director
National Museum of Science and Technology
Lahore 31

Philippines

Dr. J. Guerrero
Director
Science Promotion Institute
National Science and Technology Authority (NSTA)
Presidential Management Staff
San Miguel, Manila

Republic of Korea

Mr. Kim Chi Moon
Director
Department of Research and Planning
National Science Museum
Seoul

Singapore

Miss Foo Tok Shiew
Head
Life Sciences Department
Singapore Science Centre
Science Centre Road
Singapore 2260

Sri Lanka	Mr. K. Ponnampalam Field Studies Centre Department of Education Jaffna Region Jaffna
Thailand	Mr. Boonreong Keo-sa-ard Director Centre for Educational Museums 928 Sukhumvit Road Bangkok 10110
Unesco	Dr. G. Teterin Programme Specialist Division of Science, Technical and Vocational Education UNESCO 7, Place de Fontenoy, 75700 Paris France
	Dr. M.C. Pant Specialist in Science Education Asian Centre of Educational Innovation for Development Unesco Regional Office for Education in Asia and the Pacific Darakarn Building 920 Sukhumvit Road Bangkok 10110
	Dr. Wimala Ponniah Regional Adviser in Environmental Education Unesco Regional Office for Education in Asia and the Pacific Darakarn Building 920 Sukhumvit Road Bangkok 10110
ICC	Dr. Twee Hormchong Vice-President of ICC for Southeast Asia Faculty of Science Srinakharinwirot University Bangsaen, Chonburi 20131 Thailand
Resource person	Dr. Thamrong Buasri 317/2 Ekamai Road

Sukhumvit Soi 63
Bangkok 10110

Observers

1. Miss Sunanta Thipmalmas
   Educator
   The Curriculum Development Centre
   Sukhumvit Road, Bangkok 10110
2. Miss Chiensri Vividhasiri
   University Lecturer
   Faculty of Education
   Srinakharinwirot University
   Sukhumvit 23, Bangkok 10110
3. Mr. Chuan Srigisanaruksa
   Supervisor
   Supervisory Unit
   Teacher Educational Department
   Ministry of Education
   Bangkok 10300
4. Mrs. Chongdee Sangpetch
   Supervisor
   Supervisory Unit
   Department of Primary Education
   Ministry of Education
   Bangkok 10300
5. Miss Tiny Anakasant
   Science Supervisor in Secondary Education
   Department of General Education
   Ministry of Education
   Bangkok 10300
6. Mrs. Wichian Samart
   Director
   Satreemahapruttaram Girls' School
   Sriphraya, Bangrag
   Bangkok 10500
7. Mr. Witthaya Boonthanom
   Head
   Chemistry Department
   Faculty of Science

Srinakharinwirot University
Bangsaen, Chonburi
Chonburi 20131

8. Miss Salin Weerabut
   Educational Officer
   Bangkok Planetarium
   928 Sukhumvit Road
   Bangkok 10110

9. Mrs. Praneet Vibulayapraphan
   Assistant Professor
   Faculty of Education
   Ramkamhaeng University
   Bangkok 10240

10. Mr. Chalong Intasian
    Assistant Professor
    Department of Secondary Education
    Faculty of Education
    Chiang mai University
    Chiang mai 50002

11. Mr. Yuthana Smitasiri
    Assistant Professor
    Department of Biology
    Faculty of Science, Chiang Mai University
    Chiengmai 50002

12. Mrs. Jantanee Komalmit
    Scientist
    Ministry of Science, Technology and Energy
    Yothi Road
    Bangkok 10400

13. Mrs. Viboonlak Thongcheua
    Head of Non-formal Education Section
    Educational Planning Division
    National Education Commission
    Sukho Thai Road, Bangkok 10300

14. Dr. Prachoomsuk Achava-amrung
    Professor Emeritus
    Chulalongkorn University
    Bangkok 10500

15. Dr. Yupa Viravaidhaya
    Assistant Professor
    Faculty of Education
    Kasetsart University
    Bangkhen, Bangkok 10900
16. Dr. Therachai Puranajoti
    Associate Professor
    Educational Department
    Chulalongkorn University
    Bangkok 10500

Annex II
Addresses

Inaugural Address by H.E. Dr. Kasem Sirisumpundh
Minister of Education, Thailand

Mr. President of the Science Society of Thailand,
Assistant Director-General of Unesco,
Honourable Guests,
Distinguished Participants,
Ladies and Gentlemen,

It is a great honour and privilege for me to be with you at the Opening Ceremony of the Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities by Young People. May I take this opportunity, on behalf of the Thai Government, to extend to the distinguished participants, resource persons and honoured guests from abroad a sincere welcome to our capital city of Bangkok. My warm welcome is also extended to the prominent local experts who have kindly accepted to serve as resource persons in this Regional Workshop.

It is indeed most heartening to learn that the various member countries of Unesco in Asia and the Pacific share with Thailand our realization of the significance and impact of science and technology on national development as well as on our daily life. A Workshop such as this reflects our common need to improve ways and means of making knowledge and information regarding science and technology accessible to all and in particular to youths, who constitute our main target group. Allow me therefore to place on record here my profound appreciation to Unesco for having continuously given encouragement and support to the activities concerning science and technology in this region. I would also like to take this opportunity to express my warmest thanks to the Science Society of Thailand, the ICC and other agencies whose fervent support and assistance have made this Regional Workshop possible.

In my view, the Regional Workshop is most opportune, as it is being held during the year when the Thai people are celebrating the bicentenary of the founding of our present capital city of Bangkok. As the President of the Science Society of Thailand has already mentioned, the Thai Government has declared the eighteenth of August our "National Science Day". Hence it is most timely and appropriate to organize this Workshop in the month of August during which many activities are undertaken to highlight the significance of our National Science Day.

Like many other developing countries, Thailand is still beset by the problem of population increase with the undesirable result that, in spite of all the efforts made and resources allocated for the education of our people, a vast majority receive only primary education. For economic reasons, these unfortunate people are unable to continue their education beyond this level and have to leave school to earn their living. The Ministry of Education has therefore placed a great emphasis on non-formal education. Realizing the important role that science and technology play in our present society, the Ministry has made every effort to make out-of-school scientific activities accessible to all, and in particular to young people. The establishment of the National Science Museum, which has the honour of being chosen as the venue of the Regional Workshop, is a manifestation of such efforts. The benefits derived from its programmes and activities are indisputable. Thus it is our main aim to establish such museums in other parts of the country so that people in other regions can enjoy similar privileges.

Ladies and Gentlemen, the ways and means of enabling our youths to participate in out-of-school scientific activities are many and I have no doubt that this Regional Workshop will prove a useful exercise and a fruitful experience to all concerned. I am confident that the collective wisdom of all the participants will lead to its most successful conclusion. In spite of your busy schedule ahead of you, I nevertheless hope that you will be able to find some time to enjoy and appreciate the many attractions that Bangkok has for our visitors from far and wide.

As time is now auspicious, may I declare open this Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities by Young People and wish you all every success in your deliberations.

Thank you.

Statement of Mr. Raja Roy Singh, Assistant Director-General, Unesco Regional Office for Education in Asia and the Pacific

Your Excellency Minister of Education of the Government of Thailand,
Ladies and gentlemen,

It is a pleasure as it is a privilege for me to extend to you a most cordial welcome on behalf of Unesco and on my personal behalf.

We are most grateful to you, Your Excellency, for your presence with us today, despite the many heavy calls on your time by duties of State. It bears witness to the deep interest you have in promoting science and science education.

Our sincere thanks go out to the Science Society of Thailand for agreeing to jointly host with Unesco Asian Centre of Educational Innovation for Development this "Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities by Young People". It is befitting that this Workshop is being organized by the Science Society this year as Thailand is celebrating its Rattanakosin Bicentennial. Only last week Thailand also celebrated its first National Science Day to honour King Mongkut, the founding father of science in Thailand.

Science is not only what the scientists do; it is also what its application makes it to be. Equally important, it is also a way of looking at reality, events, the world; an attitude of the mind, the scientific spirit. Science therefore is not a body of skills or even of knowledge intended for a select group. It has to become the possession of all people, as knowledge which shapes the perception of the world and events, as application which gives control over events and materials. In our developing countries specially, access to science education in a form appropriate to different population groups is surely a goal, the attainment of which is indispensable for overall socio-economic development.

Science education therefore has been an important concern of all the Member States of the region, and high priority has been accorded to its expansion and qualitative improvement. Increasingly the recognition is gaining ground that special attention needs to be given to making access to science and technology education available on the widest scale.

Access to science education as part of the education provided by the schools from the very beginning is obviously important. It is now coming to be recognized that science education must be available to every student in school throughout the school career. Equally important, however, is to make science accessible to the vast population outside the school system, both adults and young people. The out-of-school population is the one that at any moment has the most decisive influence on development processes. To reach it effectively should therefore be an important part of the development strategy. In our developing countries young people form a very large segment of the population out of school. They are the ones who are going

to shape the events in the coming years. Thus access to science education and technology education for out-of-school youth becomes crucially important. Out-of-school science activities should surely be concerned with young people who are not within the school system and are part of the work force.

Out-of-school science has yet another aspect. It is an extension of science education within the school system but not carried out within the confines of the classroom. The world outside opens its wealth of learning experiences for enriching the teaching of science and technology.

An out-of-school setting offers a host of possible locations such as factories, shops, streets, forests, streams, ponds, farms, deserts, beaches, sea, and many such other locations which have immense educational potential for serving as scientific laboratories for observation, data collection, experimentation, investigation, depending on the nature of activities. In addition, out-of-school science has access to a large community and human resources and expertise for guiding and organizing various activities. The mass media like TV, radio, newspaper are available to reach a much larger audience out of school.

During the last few decades, out-of-school education in the region has been growing and a number of related programmes and activities have been developed in almost all the countries. Amongst these, science clubs appear to be the most popular way of carrying out extra-curricular scientific activities. Science fairs, science camps, field studies centres, science museums, science films and popular science journals are receiving increasing attention. In all these endeavours, the point that I should like particularly to emphasize in the need for undertaking them on a scale and in a magtitude which reach out to the largest number of young people and become a change agent. The creation of critical mass is of decisive importance.

For the past many years Unesco has been co-operating with the Member States in various aspects of science education. The General Conference of Unesco at its Twenty-first Session held in October 1980 approved a significant programme for the development of science and technology in school and out-of-school. This programme includes activities such as international exchange of information through meetings and publications, support to development of innovative teaching-learning materials, training activities and co-operation with Member States in the development of infrastructures for science and technology education. In the Second Medium-Term Plan of Unesco for the years 1984 – 1989 which is shortly to be considered by a special session of the General Conference of Unesco, science and technology education has a high priority. The present Regional Workshop is thus meeting at a very opportune time and we shall look forward to your deliberations with profound interest.

May I now request Your Excellency to inaugurate the Workshop and address it.

Welcome Address by
Associate Professor Dr. Kamchad Mongkolkul
President, Science Society of Thailand

Your Excellency the Minister of Education,
Distinguished Guests, Respected Participants,
Ladies and Gentlemen,

On behalf of both the Science Society of Thailand under Royal Patronage and the Organizing Committee of the Workshop, it is a great honour and pleasure for me to greet all participants and observers to this "Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities" with a warm traditional Thai welcome: "Swasdee, Kho Ton Rub Duay Kwarm Yindee."

Ladies and Gentlemen, most of you already know that 1982 is the bicentennial anniversary of Bangkok. In accordance with the government policy, the Science Society of Thailand has tried to organize many scientifically relevant activities both at the national and regional levels to commemorate the Rattanakosin Bicentennial. By a fortunate coincidence, last April the Government approved a proposal initiated by the Science Society of Thailand to officially honour King Mongkut, our present King's great-grandfather, as "The Father of Thai Science" and to declare the 18th of August every year as "National Science Day". I don't know whether any of the participating countries have also their own "Fathers of Science" and "National Science Days", but in places like Thailand where science has yet to be more fully appreciated, promotion is constantly required.

In celebrating the first National Science Day during the Rattanakosin Bicentennial year, the Science Society of Thailand has organized a series of activities. A foundation was set up to support an annual award of 100,000 baht to be presented to the outstanding Scientist of the Year. Other awards and prizes include those for Model Science Teachers of the Year, Science Talent scholarships, winners of youth science projects and science quiz competitions. Scientific exhibitions by governmental and private organizations have also been held. Closer to the theme of this Workshop, an Asian Youth Science Fair was also organized. Due to an unfortunate time constraint, only seven of the more than forty projects were received from three other countries.

In an attempt to widen the scope of activities of the National Science Day, the Science Society of Thailand arranged a panel discussion on "Policy of Political Parties on the Use of Science and Technology for National Development" with the participants being the political party chairmen, or deputies, of Thailand's five leading political parties. Last weekend some

800 school and college teachers of science also took part in a two day conference on "Science education and its impact on the development of Thailand."

The Science Society of Thailand is most honoured to close the double celebration of Rattanakosin Bicentennial and National Science Day with this "Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities by Young People." I would like to take this opportunity to express my sincere appreciation to Unesco, its Asian Centre of Educational Innovation for Development (ACEID) and the Ministry of Education for their financial and other assistance.

Ladies and Gentlemen, on behalf of the Organizing Committee, I extend to you a most hearty welcome. Sawasdee Khrap.

Report by
Dr. Twee Hormchong
Vice President of ICC for Southeast Asia
and Vice Chairman of the Organizing Committee

Your Excellency,

On behalf of the Organizers of the Workshop, I would like to express my deep gratitude and sincere thanks to your Excellency for your kindness and thoughtfulness given to this Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities by Young People.

First of all I would like to give Your Excellency a brief report concerning this Workshop. As you may know, Your Excellency, within the umbrella of the Science Society of Thailand, the society consists of various sections : Science Teachers Section, Chemistry Section, Physics Section, Biology Section and Science Clubs of Thailand Section.

During the past two decades, the Science Clubs of Thailand Section has played an important role in out-of-school scientific activities. We have organized National Science Fairs and Summer Youth Science camps and arranged competitions on Scientific Projects for more than ten consecutive years. Therefore, the Science Clubs of Thailand Section has been recognized as a powerful educational endeavour for science teaching and learning by the students as well as science teachers in most of secondary schools in Thailand.

Concerning the out-of-school scientific activities, especially this Regional Workshop, I would like to draw your attention to the International Coordinating Committee for the Presentation of Science and Development of Out-of-School Scientific Activities (ICC). Its Secretariat Office is in Brussels, Belgium, and the ICC has been receiving continued support and recognition from Unesco. In fact, the Secretary-General of the ICC, Mr. Roger Otthiers was planning to come to participate in this Workshop, but unfortunately he is unable to make it. However, Professor Henry Teterin, Programme Specialist, Division of Science, Technical and Vocational Education, Unesco, Paris, who has given a strong support and assisted all activities of the ICC, has been able to join this Workshop.

To give you some more details, please allow me to mention about the last Executive Board Meeting of the ICC held in Bonn in May 1981. The Executive Board of ICC decided that an activity of ICC, the Asian Science Fair, may be organized in Thailand during 1981 or 1982.

The past experiences of ICC has shown that without the financial support from Unesco and the Government of the country concerned, ICC activities are not possible. It is also true for this Regional Workshop.

With the most kind offer of Mr. Raja Roy Singh, the Assistant Director-General of Unesco Regional Office for Education in Asia and the Pacific, and with the kind advice and assistance of the two persons, Dr. A. Latif, Chief of the Asian Centre of Educational Innovation for Development (ACEID) and Dr. M.C. Pant, Specialist in Science Education of Unesco, it was agreed to enlarge the Asian Science Fair, by also organizing at the same time the Regional Workshop for Key Personnel Concerned with Out-of-School Scientific Activities under a contract by the Science Society of Thailand.

Here I would like to express the most grateful thanks of the Science Society of Thailand and the Organizing Committee of this Workshop to the Unesco National Commission of Thailand and its Secretary-General Dr. Saiyut for all the administrative help and support in finalizing the contract with Unesco which has enabled us to organize this Workshop.

The Workshop would have the following main objectives : Firstly, to discuss the role of out-of-school scientific activities, both in formal and non-formal education programmes; secondly, to exchange experiences in the planning, organization and evaluation of out-of-school scientific activities by young people and develop related guidelines; thirdly, to identify trends, problems and issues in this regard; and lastly, an outline of a training handbook, on the organization of out-of-school scientific activities.

In this gathering, there are representatives from 15 countries. I strongly believe that this Regional Workshop will produce valuable outcomes in regard to out-of-school science and technology education which will be beneficial to our countries in the Asia and the Pacific Region as well as in the other parts of the world.

Fellow participants, distinguished guests, ladies and gentlemen, once again, I wish to thank you all for your kind co-operation, and again to thank His Excellency Dr. Kasem Sirisampundh, Minister of Education who has so kindly consented to grace this occasion and to declare this Workshop open, May I now request Your Excellency to deliver your inaugural address.

Thank you.

Annex III
Agenda

1. Opening of the Workshop.
2. Election of the officers of the Workshop.
3. Consideration of the agenda and the provisional schedule of work.
4. Review of out-of-school scientific activities by young people in the Region and synthesis of experiences.
5. Identification of issues, problems and trends in out-of-school scientific activities and preparation of guidelines on the planning, organization and evaluation of such activities.
6. Development of outline of a training handbook for key personnel.
7. Consideration and adoptation of the draft report.
8. Closing ceremony.

ORGANIZING COMMITTEE

Chairman	Dr. Twee Hormchong Vice-President of International Co-ordinating Committee for the Presentation of Science and the Development of Out-of-School Scientific Activities (ICC) for South East Asia Faculty of Science, Srinakharinwirot University Bangsaen, Chonburi, Thailand
Secretary	Dr. Pisarn Soydhurum Acting Chief Planning and Development Section The Institute for the Promotion of Teaching Science and Technology, (IPST) 924 Sukhumvit Road Bangkok 10110, Thailand
Assistant Secretary	Dr. Pusadee Tamthai Acting Head General Science Design Team IPST 924 Sukhumvit Road Bangkok 10110, Thailand
	Dr. Jariya Suchareekul Lecturer Department of General Science Faculty of Science, Chulalongkorn University, Bangkok 10500, Thailand
Members	— Mr. Boonreong Keo-sa-ard Director National Science Museum Department of Non-Formal Education Ministry of Education, Thailand
	— Dr. M.C. Pant Programme Specialist

Asian Programme of Educational Innovation for Development
Unesco ROEAO
Bangkok 10110, Thailand

— Mrs. Nantiya Boonklurb
Acting Head
Biology Design Team
IPST
Bangkok 10110, Thailand

— Mr. Sanit Boonklurb
Supervisor
Department of Teacher Education
Ministry of Education, Thailand

— Mr. Boonsong Ruangvinyuvej
Bangkontee School
Samut Songkram, Thailand

Treasurer — Mrs. Varee Chantarasakul
Biology Design Team
IPST
Bangkok 10110, Thailand

Unesco — Dr. Henri Teterin
Division of Science, Technical and Vocational Education
UNESCO,
7, Place de Fontenoy, 75700 Paris
France

Science Society of Thailand — Dr. Kamchad Mongkolkul
President
Science Society of Thailand
Faculty of Science
Chulalongkorn University
Bangkok 10500, Thailand

Resource Person — Dr. Thamrong Buasri
317/2 Ekamai Road
Sukhumvit Soi 63
Bangkok 10110, Thailand